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COMMUNICATIONS & TECHNOLOGY

DECEMBER 2004

CQ

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Season's Greetings

FCC Rules on BPL page 13

On the Cover: Is this man really Santa Claus? Find out on page 111!

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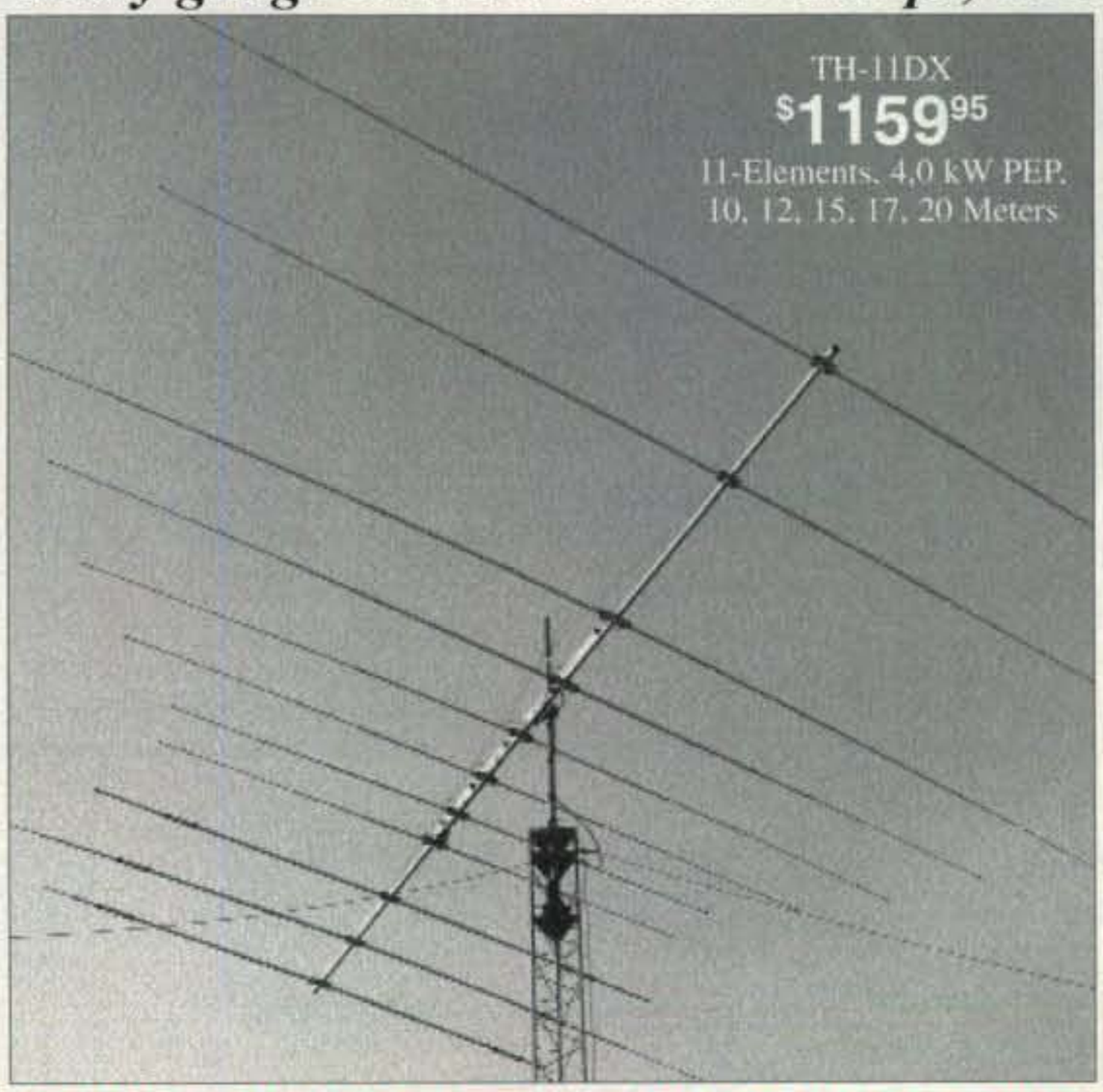

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The choice of top DXers.

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Every part is selected for durability and ruggedness for years of trouble-free service.

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7-Elements gives you the *highest average gain* of any Hy-Gain tri-bander!

Dual driven for broadband operation without compromising gain. SWR less than 2:1 on *all* bands.

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The broadband *five element* TH5-MK2 gives you outstanding gain.

Separate air dielectric *Hy-Q* traps let you adjust for maximum F/B ratio on each band.

Also standard is *Hy-Gain's* exclusive *BetaMATCH™*, stainless steel hardware and compression clamps and BN-86 balun.

TH-3MK4, $469.95. 3-element, 1.5 kW PEP, 10,15,20 Meters

The super popular TH-3MK4 gives you the *most gain for your money* in a full-power, full-size durable Hy-Gain tri-bander!

You get an impressive average gain and a whopping average front-to-back ratio. Handles a full 1500 Watts PEP. 95 MPH wind survival.

Fits on average size lot with room to spare -- turning radius is just 15.3 feet. Four piece boom is ideal for DXpeditions. Rotates with CD-45II or HAM-IV rotator.

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TH-2MK3, $369.95. 2-element, 1.5 kW PEP, 10,15,20 Meters

The 2-element TH-2MK3 is Hy-Gain's *most economical* full power (1.5kW PEP) full size tri-bander.

For just $339.95 you can greatly increase your effective radiated power and hear far better!

Ruggedly constructed, top-performing, compact 6 foot boom, tight 14.3 foot turning radius. Installs almost anywhere. Rotate with CD-45II or HAM-IV. BN-86 balun recommened.

EXP-14, $599.95. 4-element, 1.5 kW PEP, 10,15,20 Meters

Revolutionary 4-element compact tri-bander *lets you add 40 or 30 Meters!* Has 14 foot boom and tight 17.25 feet turning radius. Fits on roof tri-pod, mast or medium duty tower.

Hy-Gain's *patented* broadbanding *Para Sleeve* gives you less than 2:1 VSWR. 1.5kW PEP.

BetaMATCH™ provides DC ground to eliminate static. Includes BN-86 balun. Easily assembled.

***Truly** competitive against giant tri-banders at half the cost!*

QK-710, $179.95. 30/40 Meter option kit for EXP-14.

Compact 3-element 10, 15, 20 Meter Tri-Bander
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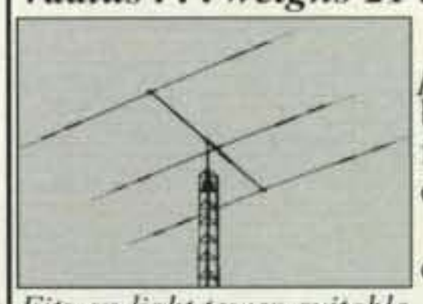

Fits on light tower, suitable guyed TV pole, roof tri-pod

TH-3JRS, $359.95. Hy-Gain's *most popular* 3-element 10, 15, 20 Meter tri-bander fits on most lots! Same top performance as the full power TH3MK4 in a compact 600 watt PEP design.

Excellent gain and F/B ratio let *you* compete with the "big guns".

Tooled manufacturing gives you *Hy-Gain* durability with 80 MPH wind survival.

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TH-11DX	11	*For Gain and F/B ratio--See...*		4000	10,12,15,17,20	12.5	100	24	37	22	88	1.9-2.5	T2X	$1159.95
TH-7DX	**7**			**1500**	**10, 15, 20**	**9.4**	**100**	**24**	**31**	**20**	**75**	**1.5-2.5**	**HAM-IV**	**$869.95**
TH-5MK2	5	• www.hy-gain.com		1500	10, 15, 20	7.4	100	19	31.5	18.42	57	1.5-2.5	HAM-IV	$759.95
TH-3MK4	**3**	• Hy-Gain catalog		**1500**	**10, 15, 20**	**4.6**	**95**	**14**	**27.42**	**15.33**	**35**	**1.9-2.5**	**CD-45II**	**$469.95**
TH-3JRS	3	• Call toll-free		600	10, 15, 20	3.35	80	12	27.25	14.75	21	1.25-2.0	CD-45II	$359.95
TH-2MK3	**2**	800-973-6572		**1500**	**10, 15, 20**	**3.25**	**80**	**6**	**27.3**	**14.25**	**20**	**1.9-2.5**	**CD-45II**	**$369.95**
EXP-14	4			1500	10,15,20 opt. 30/40	7.5	100	14	31.5	17.25	45	1.9-2.5	HAM IV	$599.95

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2. *Tooled* *Boom-to-Element Clamp*

3. Thick-wall *swaged* aluminum tubing

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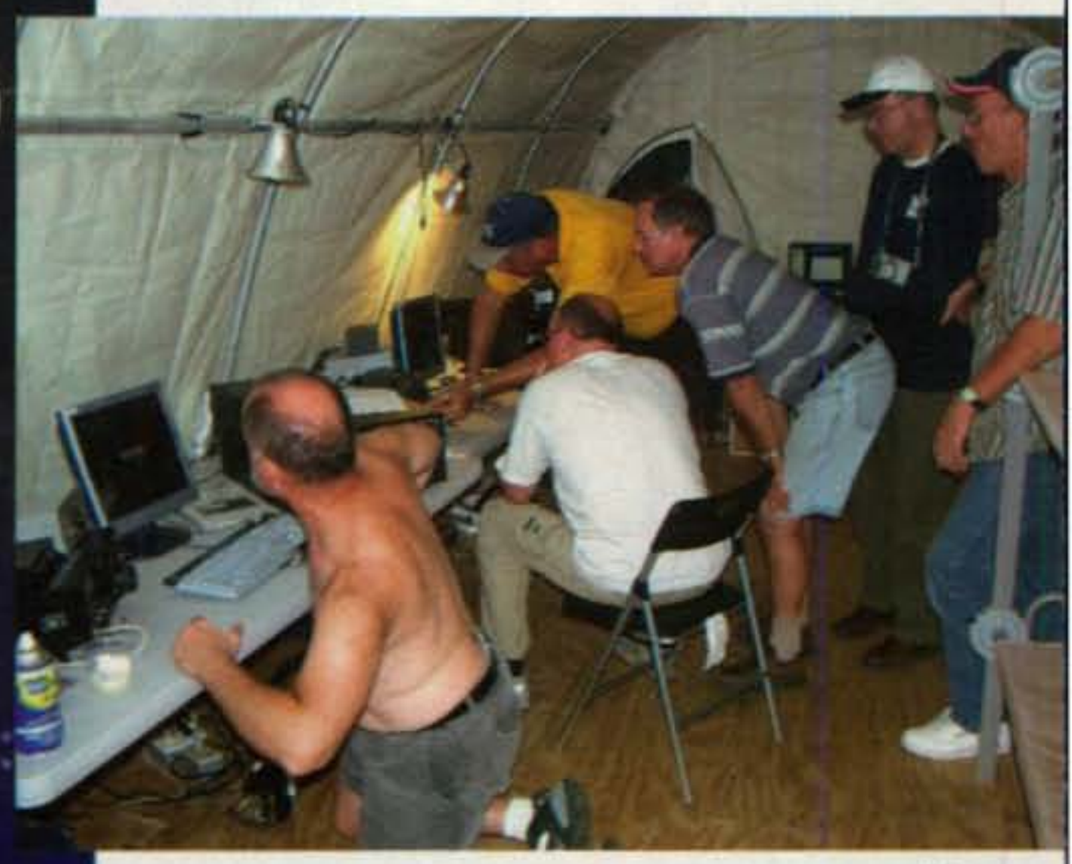

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Super flexible featherweight whip

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COMET **SMA-503** • Dual-band 2M/70cm HT Antenna
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Bright Chrome and Brushed Aluminum Finish!

NEW

Maldol **NEW AX-50** • Dual-band 2M/70cm
• Gain & Wave: 2M 1/4 wave • 70cm 5.0dBi 9/8 wave • Length: 21" • Conn: PL-259 • Max Power: 60W

NEW

Maldol **NEW AX-75** • Dual-band 2M/70cm w/fold-over
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NEW

Maldol **NEW AX-95** • Dual-band 2M/70cm w/fold-over
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COMET **B-10/B-10NMO** • Dual-band 146/446MHz cellular look-a-like
• Gain & Wave: 146MHz 0dBi 1/4 wave, 446MHz 2.15dBi 1/2 wave • Length: 12" • Conn: B-10 PL-259/B-10NMO NMO • Max Pwr: 60W

COMET **SBB-2/SBB-2NMO** • Dual-band 146/446MHz
• Gain & Wave: 146MHz 2.15dBi 1/4 wave, 446MHz 3.8dBi 5/8 wave center load • VSWR: 1.5:1 or less • Length: 18" • Conn: PL-259/SBB-2NMO NMO • Max Pwr: 120W

Maldol **NEW EX-107B/EX-107BNMO** • Dual-band 146/446MHz
• Gain & Wave: 146MHz 2.6dBi 1/2 wave, 446MHz 4.9dBi 5/8 wave x 2 • VSWR: 1.5:1 or less • Length: 29" • Conn: PL-259 or NMO Style • Max Pwr: 100W

COMET **SBB-5/SBB-5NMO** • Dual-band 146/446MHz w/fold-over
• Gain & Wave: 146MHz 2.5dBi1/2 wave • 446MHz 5.5dBi 5/8 wave x 2 • Length: 39" • Conn: SBB-5 PL-259/SBB-5NMO NMO • Max Pwr: 70W

COMET **SBB-7/SBB-7NMO** • Dual-band 146/446MHz w/fold-over
• Gain & Wave: 146MHz 4.5dBi 6/8 wave • 446MHz 7.2dBi 5/8 wave x 3 • Length: 58" • Conn: SBB-7 PL-259/SBB-7NMO NMO • Max Pwr: 70W

NEW

Maldol **NEW EX-106** • Dual-band 146/446MHz w/fold-over
• Gain & Wave: 146MHz 2.15dBi 1/2 wave, 446MHz 5.5dBi 5/8 wave x 2 • VSWR: 1.5:1 or less • Length: 38" • Conn: PL-259 or NMO Style • Max Pwr: 80W

COMET **NEW C757/C757NMO** Challenger Series • Dual-band 146/446MHz w/fold-over
• Gain & Wave: 146MHz 2.15dBi 1/2 wave, 446MHz 5.5dBi 5/8 wave x 2 • VSWR: 1.5:1 or less • Length: 38" • Conn: PL-259 or NMO Style • Max Pwr: 80W

COMET **NEW CP-5M, CP-5NMO, CP-5 3/8-24** ***Universal mount and coax cable combos.*** (SO-239, NMO, 3/8-24/PL-259) Heavy-duty, adjustable RS-730 trunk/van/SUV/truck door mount and deluxe cable assembly. 16' 6" length w/18" mini RG-188A/U type coax. Max antenna 70".

COMET **NEW C767/C767NMO** Challenger Series • Dual-band 146/446MHz w/fold-over
• Gain & Wave: 146MHz 3.5dBi 1/2 wave center load, 446MHz 6.0dBi 5/8 wave x 2 center load • VSWR: 1.5:1 or less • Length: 40" • Conn: PL-259 or NMO Style • Max Pwr: 80W

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NEW RECEIVER GIVES +30dBm TOI

Using receiver design techniques introduced in the IC-7800, Icom's engineering team focused on producing a distortion-free, high-dynamic-range. To achieve this goal, Icom used higher-grade components in vital receiver sections of the IC-756PROIII. The result? Outstanding performance, whether the whole band is calling or you're trying to pull a "new one" out of the QRM.

LARGE INDUCTORS = LOWER DISTORTION

The IC-756PROIII uses large inductors instead of small coils in the bandpass filter (BPF) stage, because small coils sometimes cause magnetic saturation in the BPF stage. Large inductors can handle both strong signals and weak signals with lower distortion.

LOW DISTORTION BPF SWITCHING

The BPF switching circuitry is one of the critical points in a receiver where distortion can be produced by strong out-of-band signals. Distortion at this early receiver stage then propagates throughout the remaining stages and cannot be removed by signal processing. The IC-756PROIII uses low distortion diodes with wide frequency characteristics that prevent formation of distortion components in the BPF stage.

NEW IC-756PROIII

A fusion of the great features from the '756PROII with new technology from the '7800!

ldn't get any better!

LOW IMD ROOFING FILTER

The IC-756PROIII uses a fundamental-mode monolithic crystal filter for the roofing filter. Although it's more expensive than overtone-mode filters, this filter has a better shape factor and is less susceptible to intermod distortion under strong signal conditions. This is the same filter used in the IC-7800.

TWO NEWLY DESIGNED PREAMPLIFIERS

To minimize distortion and maximize dynamic range, the IC-756PROIII preamps use the same basic circuit design as those in IC-7800. Preamp-1 is a noiseless feedback design, with push-pull amplifiers. This design has a high intercept point and covers a wide frequency range. Preamp-2 uses bipolar transistors for higher gain, ideal when you use separate low-efficiency receiving antennas such as small loops or Beverages.

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ham radio news

FCC Adopts BPL Rules

The FCC adopted new rules in mid-October establishing a technical and regulatory framework for Broadband over Power Lines (BPL), a method of delivering high-speed internet access via standard power lines. BPL signals use frequencies between 3 and 60 MHz, and the unshielded nature of power lines has led to significant interference to hams and other HF/low-VHF spectrum users in BPL test areas. Hams objected most loudly to the interference potential of BPL because they tend to operate from residential areas where BPL is most likely to be deployed and because the frequency-agile nature of ham operations makes it impractical (if not impossible) for BPL providers to "notch out" amateur frequencies as they have been able to do for other services operating on one or more discrete frequencies.

The new rules did put in place certain protections against interference and set up procedures for identifying and dealing with problems as they occur. For more details, see page 13. The text of the FCC's Report & Order had not been released as of press time. W5YI will examine that in his "Washington Readout" column in next month's issue.

FCC Seeks Input for Rural Wireless Broadband Initiative

The FCC is sponsoring an essay contest on bringing *wireless* internet service to rural communities (despite the fact that it's also touting BPL as the best way of bringing broadband internet access to rural areas). The "Rural Wireless Community VISION" program is a joint effort between the FCC's Wireless Telecommunications Bureau and the Rural Utilities Service of the US Department of Agriculture.

Civic leaders or designated representatives in rural areas are invited to submit two-to-five page essays explaining their vision for making use of broadband wireless internet service in their communities, and how their communities would benefit from having this service. The essays will be used to select locations for pilot projects of community-wide wireless broadband. For more details, see <http://wireless.fcc.gov/outreach/ruralvision>.

Solar Cycle May Be Heading for Early End

Solar observers now believe the current sunspot cycle may hit bottom as much as a year earlier than expected, based on multiple observations of zero sunspots. The roughly 11-year solar cycles greatly influence long-distance radio communication on Earth. A quick end to the current cycle suggests that good DX on the low bands of 160 and 80 meters will be with us sooner than expected, and that the recovery of the higher shortwave bands, from 20–10 meters, will begin sooner than expected as the new cycle takes hold. For more details, see this month's "Propagation" column on page 99.

AMSAT Seeks Delay in Orbital Debris Rule

As reported here last month, the FCC has included amateur satellites in a new rule requiring that all satellite builders incorporate plans to minimize orbital debris from their satellites. The AMSAT News Service reports that AMSAT has petitioned the FCC to delay implementation of the new rules and to exempt amateur satellites currently in design and construction phases, along with those projects for which launch commitments have already been contracted. See the AMSAT website at <http://www.amsat.org> for details.

Hams Continue Hurricane Help

Ham radio volunteers in Florida and the Caribbean couldn't catch a break through August and September, as four hurricanes hit various parts of the Sunshine State in a matter of weeks. Hurricanes Charley, Frances, Ivan, and Jeanne all caused massive damage in Florida, other eastern states, and the Caribbean. For details on the ham radio response to Hurricane Ivan, see this month's "Public Service" column on page 34. Also, please see the announcement in "Zero Bias" (page 8) of a ham radio holiday toy drive being coordinated by the ARRL.

As bad as the storm damage was in Florida, it was worse in parts of the Caribbean, particularly in Haiti, which was subjected to massive flooding as a result of Hurricane Jeanne. Nearly 1300 people were killed by the storm. The ARRL reports that the Disaster Preparedness and Emergency Response Association (DERA), a private agency, was sending a team to Gonaives, Haiti in early October to help provide relief services and communications, both within the city and between Haiti and the U.S. One of the team members is Catherine Lawhun, KG4UKI, who was to be setting up an HF/VHF/UHF station built around an ICOM IC-706 MkIIG transceiver. DERA was also planning to distribute handheld GMRS transceivers to as many volunteers as possible, including medical personnel from Doctors Without Borders. The ham station will remain in Haiti after the volunteers are finished with their work. For details, see the DERA special projects website at <http://www.manywaters.org/haiti.htm>.

FCC Affirms $10K Fine Against Ex-Ham

The FCC's Enforcement Bureau has finalized a preliminary decision to levy a $10,000 fine against Californian Jack Gerritson, formerly KG6IRO. According to the FCC's Forfeiture Order, Gerritson—who'd been convicted of interfering with police radio communications in 2000—violated provisions of his probation by getting back on the air and causing additional interference, this time primarily to hams. Gerriston had challenged the FCC's decision to "set aside" his amateur license grant in 2001 on the basis of his earlier conviction and subsequent interference complaints. The FCC dismissed those claims and affirmed its original fine of $10,000 for unlicensed operation and intentional interference.

SERA Reverses Course on Mandatory Tones

The SouthEastern Repeater Association (SERA) has reversed a controversial decision, reported here last month, to require tone control on all SERA-coordinated repeaters in order to reduce interference between repeaters. SERA is the nation's largest repeater coordinating organization, covering all or part of eight southeastern states. According to the *ARRL Letter*, SERA's board of directors repealed the policy "after much discussion" on October 4, amid strong objections from repeater owners in areas where interference is not a problem. SERA President Roger Gregory, W4RWG, said the group might revisit the issue sometime in the future, but with more member input before a decision is made.

(Continued on p. 10)

Additional and updated news is available on the Ham Radio News page of the CQ website at <http://www.cq-amateur-radio.com>. For breaking news stories, plus info on additional items of interest, sign up for CQ's free online newsletter service. Just click on "CQ Newsletter" on the home page of our website.

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HAM IV and HAM V Rotator Specifications	
WindLoad capacity (inside tower)	15 square feet
Wind Load (w/mast adapter)	**7.5 square feet**
Turning Power (in lbs.)	800
Brake Power (in lbs.)	**5000**
Brake Construction	Electric Wedge
Bearing Assembly	**dual race/96 ball bearings**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight (lbs.)	26
Effective Moment (in tower)	**2800 ft/lbs.**

TAILTWISTER SERIES II

For large medium antenna arrays up to 20 sq. ft. wind load. Available with *DCU-1 Pathfinder* digital control (T2XD) or standard analog control box (T2X) with *new* 5-second brake delay and *new* Test/ Calibrate function. Low temperature grease, alloy ring gear, indicator potentiometer, ferrite beads on potentiometer wires, *new* weatherproof AMP connectors plus 8-pin plug at control box, triple bearing race with 138 ball bearings for large load bearing strength, electric locking steel wedge brake, North or South center of rotation scale on meter, low voltage control, 2 1/16 inch max. mast.

T-2X
$649.95

T-2XD
$1029.95
with DCU-1

TAILTWISTER Rotator Specifications	
Wind load capacity (inside tower)	20 square feet
Wind Load (w/ mast adapter)	**10 square feet**
Turning Power (in lbs.)	1000
Brake Power (in lbs.)	**9000**
Brake Construction	Electric Wedge
Bearing Assembly	**Triple race/138 ball brngs**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight (lbs.)	31
Effective Moment (in tower)	**3400 ft/lbs.**

CD-45II

CD-45II
$389.95

For antenna arrays up to 8.5 sq. feet mounted inside tower or 5 sq. ft. with mast adapter. Low temperature grease good to -30 F degrees. *New* Test/Calibrate function. Bell rotator design gives total weather protection, dual 58 ball bearing race gives proven support. Die-cast ring gear, stamped steel gear drive, heavy duty, trouble free gear train, North center scale, lighted directional indicator, 8-pin plug/socket on control unit, snap-action control switches, low voltage control, safe operation, takes maximum mast size to 2 1/16 inches. MSLD light duty lower mast support included.

CD-45II Rotator Specifications	
Wind load capacity (inside tower)	8.5 square feet
Wind Load (w/ mast adapter)	**5.0 square feet**
Turning Power (in lbs.)	600
Brake Power (in lbs.)	**800**
Brake Construction	Disc Brake
Bearing Assembly	**Dual race/48 ball brings**
Mounting Hardware	Clamp plate/steel U-bolts
Control Cable Conductors	**8**
Shipping Weight (lbs.)	22
Effective Moment (in tower)	**1200 ft/lbs.**

HAM-V

HAM-V
$949.95
with DCU-1

For medium antenna arrays up to 15 square feet wind load area. Similar to the HAM IV, but includes *DCU-1 Pathfinder* digital control unit with gas plasma display. Provides automatic operation of brake and rotor, compatible with many logging/contest programs, 6 presets for beam headings, 1 degree accuracy, auto 8-second brake delay, 360 degree choice for center location, *more!*

ROTATOR OPTIONS

MSHD, $99.95. Heavy duty mast support for T2X, HAM-IV and HAM-V.
MSLD, $39.95. Light duty mast support for CD-45II and AR-40.
TSP-1, $34.95. Lower spacer plate for HAM-IV and HAM-V.

AR-40

AR-40
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For compact antenna arrays and large FM/TV up to 3.0 square feet wind load area. Dual 12 ball bearing race. Automatic position sensor never needs resetting. Fully automatic control -- just dial and touch for any desired location. Solid state, low voltage control, safe and silent operation. 2 1/16 inch maximum mast size. MSLD light duty lower mast support included.

AR-40 Rotator Specifications	
Wind load capacity (inside tower)	3.0 square feet
Wind Load (w/ mast adapter)	**1.5 square feet**
Turning Power (in lbs.)	350
Brake Power (in lbs.)	**450**
Brake Construction	Disc Brake
Bearing Assembly	**Dual race/12 ball bearings**
Mounting Hardware	Clamp plate/steel bolts
Control Cable Conductors	**5**
Shipping Weight (lbs.)	14
Effective Moment (in tower)	**300 ft/lbs.**

HDR-300A

HDR-300A
$1379.95

For ***king-sized*** antenna arrays up to 25 sq.ft. wind load area. Control cable connector, *new* hardened stainless steel output shaft, *new* North or South centered calibration, *new* ferrite beads on potentiometer wires reduce RF susceptibility, *new* longer output shaft keyway adds reliability. Heavy-duty self-centering steel clamp and hardware. Display accurate to 1°. Machined steel output.

HDR-300A Rotator Specifications	
Wind load capacity (inside tower)	25 square feet
Wind Load (w/ mast adapter)	**not applicable**
Turning Power (in lbs.)	5000
Brake Power (in lbs.)	**7500**
Brake Construction	solenoid operated locking
Bearing Assembly	**bronze sleeve w/rollers**
Mounting Hardware	stainless steel bolts
Control Cable Conductors	**7**
Shipping Weight (lbs.)	61
Effective Moment (in tower)	**5000 ft/lbs.**

Digital Automatic Controller

DCU-1
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Automatically controls T2X, HAM-IV, V rotators. 6 presets for favorite headings, 1 degree accuracy, 8-sec. brake delay, choice for center of rotation, crisp *plasma* display. Computer controlled with many logging/contest programs.

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BY RICH MOSESON,* W2VU

The Public Interest, Convenience and Necessity

All things considered, the FCC probably made as good a ruling as anyone could have expected on Broadband over Power Lines—BPL (see article, pg. 13). And that's what's really troubling.

Since its establishment in 1934, the Federal Communications Commission has been guided in its decision-making by a legal requirement to act in the "public interest, convenience and necessity." That standard has been eroding in recent years throughout the federal government, and the BPL decision reflects just how far the FCC and other federal regulatory agencies have strayed.

Ever since the days of the "robber barons," those 19th-century oil, steel and railroad magnates who let nothing stand in the way of their businesses' expansion, Congress has realized that some amount of regulation is required to protect the public from excesses of large industries and special interests. In the first half of the 20th century, a variety of so-called independent federal regulatory agencies were formed, including the FCC. The goal was to protect these agencies—and thus the public—from undue political and special-interest pressure by limiting how many commissioners could belong to one political party, and by requiring that the commissioners be appointed for specific terms, rather than serving at the pleasure of the President, which is the case for the heads of departments in the Executive Branch. The President appoints the commissioners and designates a chairman, and Congress has to approve their budgets, but beyond that, these agencies are supposed to be independent in their decision-making, and their decisions are supposed to be made in "the public interest, convenience and necessity." To do this, the agencies hired top technical experts in their fields and relied heavily on their guidance in making decisions.

The model worked pretty well for quite a long time. But in the past 20–25 years, the landscape has been changing as "deregulation" has become a dominant theme in the federal government. To be sure, many agencies, including the FCC, had gotten to the point of micromanaging the industries and services they regulated and some of those regulations were impeding legitimate progress. However, as the number and significance of the actual regulations began to fall, so did the need for quite so many technical experts, and as they retired, they tended to be replaced not by other technical experts but by lawyers who often did not really understand the fields they were responsible for regulating. At the FCC, for instance, you have plenty of experts in communications law, but a shrinking number of experts in communications technology. The result is that the decision-makers no longer know when they're being fed a line of bull by industry representatives, as was the case with BPL, and no longer have sufficient staff with expertise to point out technical flaws (and occasionally, impossibilities).

On top of that, the independence of the so-called independent agencies is eroding. Agencies originally charged with protecting the public from excesses of regulated industries and special interests now seem to see their primary mission as protecting the industries they are supposed to regulate. This is not something unique to the current administration. The only thing that changes the occupants of the White House is which special interests are being promoted. In the case of BPL, it has been clear not only that FCC Chairman Michael Powell has been an active proponent of the technology (despite the fact that regulators are not supposed to promote any one particular technology), but is echoing support from the White House as well. Any doubts about that were dispelled when the National Telecommunications and Information Administration—part of the Commerce Department and the FCC's "mirror image" for federal government frequency assignments, released its technical study on BPL.

The NTIA technical folks determined that there would likely be considerable interference, not only to hams but to aircraft, military and public safety communications, and that the methods proposed for measuring interference were insufficient. Within days, the political folks in the upper echelons started backing down, softening the recommendations and coming "this close" to making policy recommendations that directly contradicted their own agency's technical findings. It's also clear that, on issues of interest to the White House, FCC Chairman Powell doesn't make a move without its approval.

But again, this is not unique to the current administration. It was long before the current President took office that someone came up with the brilliant idea to raise billions of dollars for the treasury by selling off chunks of the electromagnetic spectrum (I bid $3 billion for the 470 nanometer band—once I own it, anyone using the color blue will have to pay me royalties!). One can no more own a particular frequency than one can own a layer of the ionosphere. But that hasn't stopped the FCC under multiple administrations from running dozens of spectrum auctions.

Again, one of the historic reasons for the existence of federal regulatory agencies is to assure the proper stewardship of public resources, whether it's a national park, a national forest or the electromagnetic spectrum. Selling off what you're supposed to be protecting is hardly proper stewardship. Nor is sacrificing the entire HF spectrum in order to provide the promise of an unregulated revenue stream to the power companies. Pressure from hams and other spectrum users prevented the FCC from going this far ... maybe. We'll have to see what really happens when we face the reality of trying to get BPL interference problems resolved.

Regardless of who wins the election for President (we should know by the time you read this—I'm writing it two weeks before Election Day), we all need to start reminding the President, Congress and the FCC that the FCC's job is to protect the *public* interest, not to promote special interests.

An Appeal for Toys

As the holiday season approaches, thousands of families in Florida whose homes were destroyed or severely damaged by this summer's back-to-back-to-back hurricanes still have no permanent place to live. Many will be spending the holidays living in someone else's home, or in some cases, in tents or cars. The ARRL is spearheading a nationwide toy drive to help bring some small amount of joy to as many children as possible among this displaced population estimated by FEMA and the Red Cross to be more than 100,000 people!

The League is asking hams across America to purchase a new toy appropriate for a child between ages 1 and 14, and to send it before Thanksgiving—unwrapped—with a QSL card or 3×5 card indicating your callsign, to:

Ham Radio
The United Way White Dove Project
50 Kindred St. – Suite 207
Stuart, FL 34994

For those preferring to make a cash donation, checks may be sent to:

White Dove, c/o United Way of Martin County, at the above address.

While this issue will reach most readers with only days to spare before the Thanksgiving cutoff for toys, we urge as many of you as possible to do what you can to help. If you send multiple gifts, or if non-ham friends join the effort, you may include your QSL with those additional gifts as well. The cards will be collected and sent to the ARRL to track the number and geographic distribution of donations made.

Happy Holidays!

From all of us at *CQ* to each and every one of you, we hope your holidays are happy, healthy and safe.

73, W2VU

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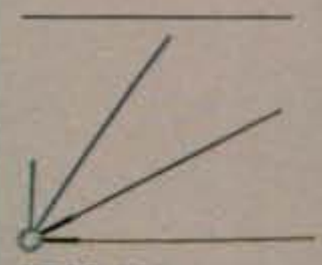

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announcements

N1CC, the 26th running of Christmas Carol special event, from Lake Charles, Louisiana; oooo–2359Z December 24–25 on SSB 7.245, 14.275, 21.375, and 28.475 MHz. Other frequencies may be announced at <http://users.aol.com/n1cc>. Check the website for QSL information, or QRz.com.

W2W, special event from commemoration of the attack on Pearl Harbor, Baltimore, Maryland; Historical Electronics Museum ARC; 1400–2200Z December 4–7, in the General portion of the HF bands SSB and CW. For certificate and QSL, send QSL and a 9×12 envelope with 60 cents postage (for QSL only business-size SASE) to HEMARC W3HEM, P.O. Box 746 MS 4015, Baltimore, MD 21203. <www.qsl.net/w3gr>

VC9COAL, from the 100th anniversary of the naming of Minto, New Brunswick, Canada, the special event station will be on the air during the month of December. QSL to VE9WGS, Wade Smith, 96 Immigrant Road, Chipman, NB, Canada E4A 1B7. <http://www.qsl.net/ve9wgs/>

Superstition ARC Hamfest, Saturday, December 4, the west parking lot, Maricopa Community College, Mesa, Arizona. Contact Steve Gurley, KY7W, 480-620-2348; or Jim Hoggard, K7MY, 805-630-0661. (Talk-in 147.120; exams 9 AM [registration begins at 8 AM])

ham radio news

("Ham Radio News," continued from p. 6)

AMSAT Elects New Leadership

Rick Hambly, W2GPS, of Severna Park, Maryland, has been elected President of AMSAT North America, succeeding Robin Haighton, VE3FRH, who stepped down after six years of leading the amateur satellite organization. Other new officers, according to the AMSAT website, include Lee McLamb, KU4OS, Executive Vice President; and Mike Kingery, KE4AZN, VP of Operations. Frank Bauer, KA3HDO, remains VP of Human Spaceflight and Stan Wood, WA4NFY, will serve another term as VP of Engineering. Barry Baines, WD4ASW, has been named VP of Marketing and User Services.

Crossband Repeater Active on Space Station

G3HZI reports that one of the pieces of ham gear on the International Space Station (ISS) has been set up to operate full time as a crossband repeater. The crew's Kenwood TM-D700 is retransmitting on VHF anything it hears on UHF. The uplink (input) frequency is 437.800 MHz and the downlink (output) frequency is 145.800 MHz, no tones or burst required. According to Ian, a simple collinear antenna should be all you need to make contacts through the repeater. To see where the space station is located at any given time, you can check <http://science.nasa.gov/temp/StationLoc.html>.

A Spacesuit Satellite?

What do you do with a surplus spacesuit? How about turning it into a ham radio satellite? That was the idea "floated" by Russian Cosmonaut Sergei Samburov, RV3DR, at an October meeting of the Amateur Radio on the International Space Station (ARISS) team. According to a report on the ARRL website, several Russian spacesuits used for spacewalks by ISS crew members have been declared surplus. Samburov suggested outfitting one of them as an amateur satellite—maybe even putting a camera in the helmet—and launching it during a spacewalk! Delegates to the meeting discussed a variety of possibilities but agreed it could not be anything too complex or too expensive, since everything would have to be done in less than a year, anything being put into the suit would have to be installed in orbit, and no one knows how long an unpowered space suit would remain in orbit. Participants thought the idea of a spacesuit satellite would capture the attention of teachers, students, and the news media.

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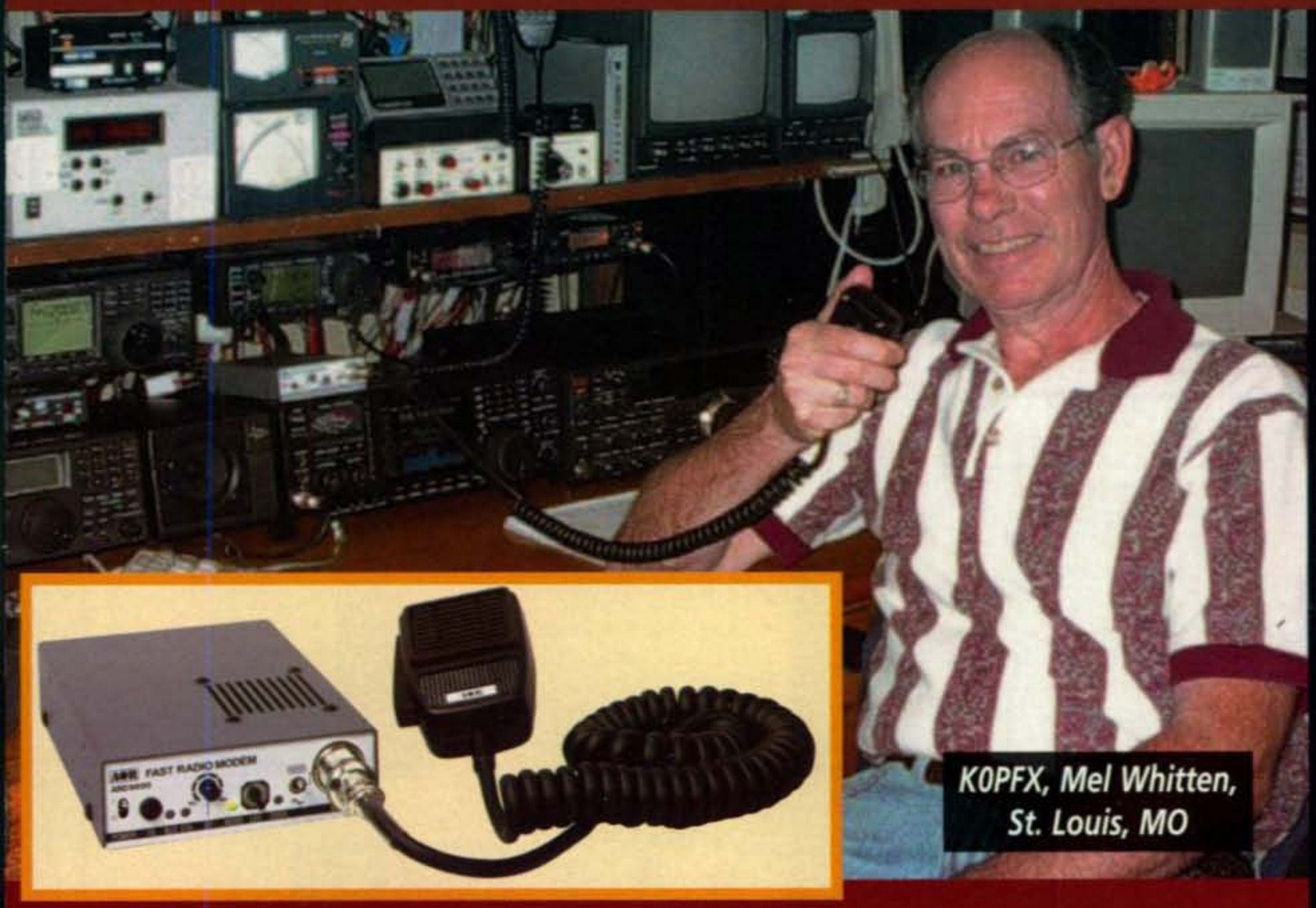

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Just before this issue went to press, the FCC adopted new rules to "encourage the development" of Broadband over Power Lines, or BPL. The new rules include some specific safeguards designed to deal with potential interference problems, but the reality of how well they will work is yet to be seen. Here are the basics, along with some early analysis.

FCC Adopts BPL Rules

Commissioners Recognize Hams' Concerns in Public Statements

BY RICH MOSESON,* W2VU

Ham radio's message about potential interference from Broadband over Power Lines, or BPL, was heard loud and clear at the top echelons of the FCC, but the commissioners' concerns about interference were not great enough to persuade them to block adoption of new rules designed to encourage the deployment of BPL around the country.

When the FCC adopted its new BPL rules on October 14, it said its main purpose in implementing the rules was "to encourage the development of Access Broadband over Power Line (Access BPL) systems while safeguarding existing licensed services against harmful interference," and indeed, the rules do provide certain protections and requirements that had been opposed by the BPL industry. In fact, the new rules are considerably more restrictive than what was previously on the books, so it was at least a partial victory for hams and others who would be adversely affected by interference from an essentially unregulated BPL service.

However, some commissioners didn't sound convinced that interference problems would be resolved quickly, and FCC Chairman Michael Powell acknowledged that "(t)here are users of spectrum that are affected by this," but essentially warned amateurs not to stand in the path of an oncoming train.

In addition, it appears from the FCC's news release that measures to be taken

The FCC, from left, Commissioners Kevin Martin and Kathleen Abernathy, Chairman Michael Powell, Commissioners Michael Copps and Jonathan Adelstein. (FCC photo)

to reduce or eliminate interference will not go so far as shutting down BPL service in interference-plagued areas. According to the FCC's announcement (the full text of the Report and Order was not available at press time), "(t)he rule changes in the Order establish specific technical and administrative requirements for Access BPL equipment and operators to ensure that interference does not occur and, should it occur, to provide for a timely resolution of that harmful interference **without disruption of service to Access BPL subscribers.**" (Emphasis added)

If correct, this would represent a significant change from past policy regarding unlicensed "Part 15" devices, for the first time giving users of a non-licensed service priority over users of a licensed service. Previous rules required that the operator of a Part 15 device causing interference to a licensed service take all necessary actions – up to and including shutting down the problem device – in order to resolve the interference.

Specific Safeguards

It is significant that the FCC acknowledged that interference is going to be a problem that will need to be dealt with, since the initial response from both the Commission and the BPL industry was that there was no interference problem. According to the FCC, the new rules incorporate the following specific provisions to help minimize interference or

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make it easier to resolve problems if (when) they occur. The Report & Order:

• Sets forth rules imposing new technical requirements on BPL devices, such as the capability to avoid using any specific frequency and to remotely adjust or shut down any unit;

• Establishes "excluded frequency bands" within which BPL must avoid operating entirely to protect aeronautical and aircraft receivers communications; and establishes "exclusion zones" in locations close to sensitive operations, such as coast guard or radio astronomy stations, within which BPL must avoid operating on certain frequencies;

• Establishes consultation requirements with public safety agencies, federal government sensitive stations, and aeronautical stations.

• Establishes a publicly available Access BPL notification database to facilitate an organized approach to identification and resolution of harmful interference.

• Changes the equipment authorization for Access BPL systems from verification to certification; and

• Improves measurement procedures for all equipment that use RF energy to communicate over power lines.[1]

The most significant of these for hams are the establishment of a publicly accessible notification database and the requirement that BPL equipment be "certified" (approved by the FCC) rather than "verified" (approved only by the manufacturer). These rules were adopted over the objections of the BPL industry.

Hams' Concerns Recognized

The concerns of hams about BPL's interference potential were not lost on the Commissioners, as reflected in their individual comments. We have highlighted in **bold type** those portions relating to amateur radio.

A joint statement by Chairman Michael Powell and Commissioner Kathleen Abernathy noted that "(b)ecause BPL is a nascent technology and the broadband market has no dominant incumbent service provider, only minimal regulations are appropriate. **However, this does not mean that we have not been cognizant of the need to protect existing licensed services from interference.** To address this issue, the Office of Engineering and Technology (OET) has done thorough testing **to ensure the rules we are adopting protect existing governmental users, amateur radio operators, and other licensees from interference.**"

Commissioner Kevin Martin said, "In this Order, we have attempted to facilitate deployment of BPL while ensuring that existing users are protected from harmful interference. Working closely with NTIA (National Telecommunications and Information Administration), we have taken strides to address interference concerns of both Government and private users. **Nevertheless, I recognize that Amateur radio operators still have concerns that they will experience interference from BPL systems**. In addition, broadcasters are concerned that BPL systems will cause interference in the low VHF band. **I take these concerns—as well as the other concerns expressed about BPL systems causing interference—very seriously.** I am confident that the Commission will continue to monitor these concerns and will take steps, where needed, to address interference problems going forward."

Commissioner Jonathan Adelstein noted that "(t)his has been a challenging proceeding. We have before us an exciting new technology in Access Broadband over Power Line (Access BPL) that has the potential to be a new broadband pipe into the home, which is so critical to pushing the deployment of broadband services across the country ... **But we also have an existing user base that includes public safety licensees, federal Government users, and amateur radio operators – important services that we need to protect from harmful interference ...** Recent Access BPL test deployments have been very useful in developing techniques to address interference issues. It is clear that some Access BPL systems can co-exist very well with existing licensees in the HF and VHF bands. In the limited cases of increased interference, the Access BPL operators were able to quickly resolve and address the interference problem. Other Access BPL systems, though, have not fared so well, and **these systems should not be deployed on a commercial basis if they will continue to result in harmful interference**... Access BPL can work side by side with existing licensees provided that Access BPL operators respond appropriately to harmful interference concerns. I encourage all affected parties to work together in a cooperative manner to address legitimate complaints of harmful interference in a timely manner.

FCC Chairman Michael Powell (front left), along with Federal Energy Regulatory Commission (FERC) Commissioner Nora Mead Brownell, and FERC Chairman Pat Wood, at a BPL demonstration in Virginia two days before the Commission voted in new BPL rules. The ARRL claimed this visit violated the FCC's own "sunshine" rules and urged the chairman to refrain from voting as a result. The League's petition was ignored. (FCC photo)

But Commissioner Michael Copps said he's still bothered by interference issues and didn't seem convinced that rules alone would be enough to prevent or resolve problems. **"I remain concerned with the question of interference to amateur radio users,"** Copps explained. **"I take the concerns of this community very seriously, and believe the FCC has an obligation to work hard to monitor, investigate, and take quick action where appropriate to resolve harmful interference."**

However, he didn't sound too confident that solutions would be either quick or easy, saying, "If interference occurs, we must have a system in place to resolve it immediately. **If an amateur radio user makes a complaint and an agreement between the BPL provider and the amateur radio user cannot be reached, the FCC should step in and resolve the matter. These cases must not take years to resolve.**"

Copps was also concerned that utility ratepayers would be stuck with higher bills to pay the costs of constructing BPL networks. He concluded, still sounding somewhat skeptical,

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FCC Moves on Other Fronts as Well

Little noticed amid the attention paid to the FCC's decision on BPL were two other actions designed to help promote different forms of broadband internet access.

In another vote taken the same day, the FCC loosened restrictions on fiber-optic networks built by local phone companies, encouraging them to make greater investments in so-called "fiber-to-the-curb" (FTTC) and "fiber-to-the-home" (FTTH) networks. According to the Commission, the ruling will "encourage deployment of fiber optic broadband networks capable of delivering advanced data, video and voice service" by local telephone companies.

The day after the BPL vote was taken, the FCC's Wireless Telecommunications Bureau announced a joint effort with the U.S. Department of Agriculture's Rural Utilities Service "to advance the deployment of broadband wireless telecommunications across rural America." The "Rural Wireless Community VISION Program" will bring experts from both agencies into rural communities selected as models to help provide technical, financial and other assistance in launching wireless broadband services in those communities. (More information on the program is available online at <http:// wireless.fcc.gov/outreach/ruralvision/index.html>.

(It is unclear whether these actions simply prove that the FCC is not promoting one variety of broadband—BPL —at the expense of others, or whether it is a sign of little confidence by the FCC in the long-term economic and/or technical viability of BPL as a significant means of providing broadband services to America.—W2VU)

"So we have a promising technology, maybe even a significant new broadband pipe, *if* everything goes really, really, well. We've got some good technical rules in this item. They can work or be adjusted *if* we have good monitoring and enforcement." (Emphasis added)

Chairman Powell had the last word, however, at the FCC's open meeting at which the new rules were adopted. Powell, by the way, ignored a last-minute ARRL petition for him to "recuse" himself from the vote, due to the fact that he'd visited a BPL test site and talked with industry officials just a few days before the Commission met to vote on the issue. According to the ARRL, this was in violation of the FCC's own procedures regarding commissioners having contact with interested parties in the days immediately preceding a vote.

In closing comments just before that vote that were not included in his formal statement released by the Commission[2], Powell addressed "**all those wonderful amateur radio operators out there**," assuring hams that they "**are still an important resource in the American communications landscape**," that the FCC continues to care about ham radio, and that "we have taken great care to ensure that the protections in this item are necessary to allow that service to continue."

But then Powell warned amateurs, in essence, not to stand in the way of progress. "But let me underscore," the Chairman concluded, "**the potential for the American economy is too great**, is too enormous, too potentially groundbreaking, **to sit idly by and allow any claim or any possible speculative fear** keep us from continuing to drive this technology and drive America into the broadband future."

(*It is curious that in the course of one paragraph, Powell goes from saying "(t)here are users of spectrum that are affected by this; we've taken that seriously from the very beginning," to dismissing those now-documented interference problems as "claims" and "possible speculative fear."—W2VU*)

ARRL Response

The ARRL's initial response to the ruling was one of cautious optimism. According to the ARRL website, League President Jim Haynie, W5JBP, said he was encouraged that the FCC's position had shifted from the early days of the BPL proceeding, when it followed the lead of the BPL industry in largely ignoring interference to amateurs as a real issue.

"What the League has done in the last year and a half on this issue showed in the Commission's public meeting today," Haynie said immediately after the vote. He cited the FCC's approval of three major points that the League had been pushing for: Certification of BPL equipment instead of verification, a requirement for a public BPL database—something the BPL industry did not want—and mechanisms to deal swiftly with interference complaints.

"Those were things that we brought to the table," he said. "I think we scored some pretty good points." Haynie conceded, however, that the specifics wouldn't be known with certainty until the full text of the *Report and Order* was released.

Details Next Month

"Washington Readout" Editor Fred Maia, W5YI, will have a full report in next month's *CQ* on the specifics contained in the *Report and Order*, and how they do or don't match up with the Commissioners' public statements.

Notes

1. FCC News Release, "FCC Adopts Rules for Broadband over Power Lines to Increase Competition and Promote Broadband Service to All Americans," Oct. 14, 2004

2. Thank you to Newsline for providing us with audio of the Commission meeting

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Hear any good meteors lately? Besides meteor scatter on the radio, there are persistent reports of occasionally being able to actually HEAR a hissing sound from a meteor, or to pick up "whistlers" from meteors on low-frequency receivers. W6BNB reports that there is a rational, physical explanation for what, on the s urface, seems impossible. You might want to look—and listen—during this month's Geminids meteor shower.

Listening To Meteors

BY BOB SHRADER,* W6BNB

During big meteor showers lately, and actually over the centuries, there have been reports by observers who say that they have heard hissing sounds that accompany bright meteors as they streak by overhead. Since a meteor's trail is 50 or so miles up in the atmosphere and sound in air travels at a speed of about a mile in five seconds, it would take about 250 seconds, or over four minutes, for any physical hissing sound made by a meteor to be heard down on Earth. In reality, it's impossible for sound produced by a meteor 50 miles up to be heard on Earth. What are people hearing?

Of course, people who have never heard such sounds while watching meteors can be tempted to believe that those hearing hissing sounds are just possibly not quite all there upstairs. However, there is a reasonably simple explanation, one which involves electronics, electricity, and electromagnetic waves.

Meteors may be either large or tiny rock-type particles, or bits of frozen water crystals, traveling at many thousands of miles an hour that strike our upper atmosphere. When they strike many of the billions of air molecules up there, they "ionize" some of those molecules. Ionization occurs when the kinetic energy of one of those moving particles pops one of the outer orbiting negative electrons of an air molecule up and out of its normal orbit. Now lacking one negative electron, the molecule becomes a positively charged "ion." Any electron hole that is developed in the molecule is almost immediately filled, usually by the popped-up electron returning back down to its normal position in the molecule. The rapidly popped-up and returning moving electrons act very much like electrons that are being moved along an antenna wire by a transmitter. In such a wire, the moving electrons produce a positive/negative "static" and a north/south "magnetic" cycle of electromagnetic energy we know as a radio wave, or field, that expands outward around its electrons at some frequency. Each "popped-up" electron ionizes its associated molecule, then de-ionizes it as it returns. However, during this traveling time the expanding electromagnetic field that is generated at some frequency around the moving electron is known as a "photon." Such expanding photon fields contain all of the kinetic energy that was spent in the original dislodgment of the electron, and the energy is now radiated as a photon field.

Back to meteors, the frequency of the photons that are generated is determined by the size and type of the meteor particle, its speed, the kinetic energy it uses to pop up the electron, the type of air molecule or atom it strikes, and how far the photon-field-generating electrons travel.

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From its name, a photon might be thought to be something that can only be seen and possibly photographed. However, meteor photons are generated in a very wide range of frequencies—from high-frequency x-rays down through the ultraviolets (UV), the visuals, the infrareds (IR), and finally down through the UHF, VHF, HF, MF, LF, VLF, SLF, and XLF frequencies. We are often shown pictures taken by x-ray, UV, IR, and visual frequency cameras. The frequencies to which a camera will respond and produce pictures depend only on what kind of film is used in the camera. So the "photo-" part of "photon" does not mean only radiated frequencies that our eyes and brain can see and detect.

The photon frequencies visible to the human eye range from the lowest or deepest red frequency of roughly 41 trillion Hz, or 41 Terahertz (THz), up to the highest visible violet frequency around 79 THz. Compare our visual bandwidth of 41 to 79 THz, or about 38 THz, with our relatively wide 80-meter bandwidth of 3.5 to 4 MHz, or 0.5 MHz. This would be a bandwidth of 0.0000005 THz! Our eyes and brain certainly form quite a broad-bandwidth frequency filter.

If a meteor looks to be bluish, it is because it is generating more photons of frequencies around 65 THz. If it appears to

be reddish, it is generating more photons around 44 THz. If it appears to be white, it is generating photons of the three colors to which the nerve endings, or "cones," in our eyes are most sensitive, the red, blue, and green frequencies. If a meteor radiates the correct number of these three color photons, its path looks white to us. (This is why our color television only transmits red, blue, and green signals!) Actually, the meteor is probably generating a lot of red, orange, yellow, green, blue, and violet photon frequencies plus the many infrared and ultraviolet, as well as much higher and lower frequencies, which our eyes cannot detect at all. Thus, whenever we see something that appears white to us, it is probably radiating photons of nearly all the visible frequencies. A white sign in daylight is actually reflecting a wide band of the photon frequencies that are given off by the sun. A blue sign is reflecting only blue-frequency photons that are picked up by our eyes. It is the chemicals in the different colored paints that determine which frequencies will be absorbed and which will be reradiated or reflected. The paints actually act as a pass-band of frequencies they do not absorb.

Hearing Meteors

Since the miles-long ionized path of a meteor can act as a conductor, it can function as a very long antenna and can efficiently radiate long-wavelength (low-frequency) electromagnetic photon waves at the very-low-frequency, or VLF, band (3 to 30 kHz), or at the super-low-frequency, or SLF, band (300 to 3000 Hz), or even at the extremely-low-frequency, or XLF, band (30 to 300 Hz), which includes most of the audio frequencies we can hear. If these lower frequency electromagnetic photon waves strike tiny objects and can make them physically vibrate at their frequencies, they can convert their electromagnetic energy to mechanical vibrating energy. These "transducers" might include things such as tiny pine needles, thin blades of grass, hair, thin aluminum foil, etc.

The wide variety of physically vibrating frequencies that can be produced by the different frequency photons may produce air waves of the many simultaneously developed tones needed to produce the hissing sounds (not a single-tone frequency) that some meteor observers have heard. Since all photons travel at the speed of light—186,000 mi/sec—just as all radio waves do, the low-frequency photons that change anything to audible vibrations will do so at the same time that visible frequency photons are seen as a streaking meteor. Therefore, it is possible to see a meteor and hear the results of its trail at the same time! Maybe those "not-so-smart" listeners were not really the dumb ones?

Whistlers

Because a meteor loses energy by producing electromagnetic radiation energy as it travels through the atmosphere, it slows down. Meteor particles heat due to friction against air molecules, causing them to glow and even explode. Any particle of a fractured meteor can also cause ionization of air molecules, which may themselves begin to glow and explode. As a result, a meteor trail may start as a thin, hardly visible line. The streak may increase in width as explosions occur at its mid trail and end up as a slower moving, perhaps slightly reddish streak. As it slows, it can still ionize air molecules, but it may now produce more photons in the lower visible frequency range, which we see as red. If it finally explodes completely, it may end up as a short white or reddish blotch. The author has seen a couple of meteors coming almost directly toward him, appearing first as a slowly moving, tiny white dot with a very short tail. They became brighter and brighter rapidly and then suddenly turned reddish, expanded, and disappeared.

If meteors come in at such low speeds that they produce no visible frequency photons, they may produce invisible lower frequency photons. The ionized paths of larger meteors may also be heard as "whistlers," or decreasing-frequency sounds, on low-frequency receivers. A VLF receiver can be as simple as a tuned or untuned AF amplifier with an antenna wire connected to its input. The ionized conductive meteor paths can also reflect our amateur radio signals, resulting in long-range information exchanges on frequencies not expected to produce such long radio paths.

Any meteor, or part of a meteor, that is able to make it through the atmosphere in one piece and land on the surface of the Earth is known as a "meteorite." It may be in the form of iron or other metals, or be rock-like and be almost any size up to perhaps half a foot or so in diameter. Meteorites too much larger than this might cause considerable damage at the area where they hit the ground.

Watching (and Listening) for Meteors

What's be the best time to see meteors? Actually, a few sporadic meteors can be seen on almost any clear night if you are willing to watch and wait long enough. It has been said that the Earth may be the recipient of perhaps as much as 40 tons of extraterrestrial junk hitting its atmosphere and splitting into dust and meteorites every day! The best times to see meteors are from about midnight to the pre-dawn hours. Of course, the sky must be clear. The farther you are from city or other lights and the darker the moon, the better your meteor-watching experience will be. Your best chances, though, come during meteor showers, when the Earth passes through trails of dust left behind by passing comets. Early astronomers, however, had not made that connection, so they named the showers after the constellations from which the "shooting stars" appeared to originate.

A good meteor shower to watch is the *Perseids*. The most productive nights are around the middle of August. Do a web search on "Perseids shower" for information on the next one. If there happens to be a full or nearly full moon, only the brightest meteors may be visible on such nights, but . . . those which *are* visible during full-moon nights have good prospects of also being heard.

There are several other meteor showers during the year, but lying out under the stars during early morning hours during spring, fall, and winter may not be too appealing. On the other hand, if you live in a warmer part of the world or like being outside at night in freezing temperatures, this year's *Geminids* meteor shower in mid-December is predicted to be one of the year's best in terms of number of meteors per hour (ZHR). The International Meteor Association predicts this year's peak to be December 13 at about 2220 UTC, but there should be plenty of meteors to see —and maybe hear—for a few nights before and after. It will be worth a try if you can tolerate December temperatures. Otherwise, hold on to this until next August and try it then!

During one of the peak nights of your preferred meteor shower, try watching for meteors with an ear near some sort of a small transducer and in a place where the transducer can be struck by photons from the meteor. See if you can hear the hissing of any of the brighter meteors. It will be a really unusual SLF or XLF signal you will be hearing, and what a unique receiver you will be using! You might also try connecting a fairly long antenna wire to the input of an audio amplifier to see if you can hear a whistler as you see its meteor. E-mail me if you hear any meteors. Indicate what type of transducer worked for you, and whether you tried to hear any whistlers. Your results will be reported in a future issue of CQ. 73 and GL.

SAVE BIG ON ANTENNAS, TOWERS & CABLE

TELESCOPING ALUMINUM TUBING

DRAWN 6063-T832

.375	$.70/ft	1.250"	$1.55/ft
.500"	$.80/ft	1.375"	$1.75/ft
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.750"	$1.00/ft	1.625"	$2.25/ft
.875"	$1.10/ft	1.750"	$2.50/ft
1.000"	$1.20/ft	1.875"	$2.75/ft
1.125"	$1.35/ft	2.000"	$3.00/ft
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IN 6' OR 12' LENGTHS. 6' LENGTHS SHIP UPS. CALL FOR 3/16"AND 1/4" ROD, BAR STOCK, AND EXTRUDED TUBING.

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13B2/A148-10S	$159/89
A270-6S/A270-10S	$79/99
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A50-3S/5S/6S	$99/169/269
A6270-13S	$199
AR2/ARX2B	$55/69
AR270/AR270B	$89/99
R6000/R8	$309/459
X7/X740	$649/269
XM240	$679

CALL FOR MORE CUSHCRAFT ITEMS.

FORCE 12–MULTIBAND

C3	10/12/15/17/20m, 7 el	$659
C3E	10/12/15/17/20m, 8 el	$699
C3S	10/12/15/17/20m, 6 el	$579
C3SS	10/12/15/17/20m, 6 el	$599
C4	10/12/15/17/20/40m, 8 el	$799
C4S	10/12/15/17/20/40m, 7 el	$719
C4SXL	10/12/15/17/20/40m, 8 el	$1019
C4XL	10/12/15/17/20/40m, 9 el	$1189
C19XR	10/15/20m, 11 el	$999
C31XR	10/15/20m, 14 el	$1389

CALL FOR MORE FORCE 12 ANTENNAS.

TRYLON "TITAN" TOWERS

SELF-SUPPORTING STEEL TOWERS

T200-64	64', 15 square feet	$1209
T200-72	72', 15 square feet	$1429
T200-80	80', 15 square feet	$1649
T200-88	88', 15 square feet	$1949
T200-96	96', 15 square feet	$2249
T300-88	88', 22 square feet	$2189
T400-80	80', 34 square feet	$2089
T500-72	72', 45 square feet	$1979
T600-64	64', 60 square feet	$1869

MANY MORE TRYLON TOWERS IN STOCK.

BENCHER / BUTTERNUT

Skyhawk, Triband Beam	$1129
HF2V, 2 Band Vertical	$249
HF5B, 5 Band Minibeam	$359
HF6VX, 6 Band Vertical	$339
HF9VX, 9 Band Vertical	$369
A1712, 12/17m Kit	$54
CPK, Counterpoise Kit	$129
RMKII, Roof Mount Kit	$159
STRII, Roof Radial Kit	$125
TBR160S, 160m Kit	$139

CALL FOR MORE BENCHER/BUTTERNUT.

M2 VHF/UHF ANTENNAS

144–148 MHZ

2M4/2M7/2M9	$95/109/129
2M12/2M5WL	$165/209
2M5-440XP, 2m/70cm	$179

420–450 MHz

440-470-5W/420-450-11	$139/95
432-9WL/432-13WLA	$179/239
440-18/440-21ATV	$129/149

SATELLITE ANTENNAS

2MCP14/2MCP22	$169/239
436CP30/436CP42UG	$239/279

ROHN TOWER

25G/45G/55G	$99/209/259
25AG2/3/4	$119/119/129
45AG2/4	$229/249
AS25G/AS455G	$49/109
BPC25G/45G/55G	$89/119/129
BPL25G/45G/55G	$99/129/149
GA25GD/45/55	$79/109/139
GAR30/GAS604	$39/29
SB25G/45/55	$49/109/129
TB3/TB4	$99/119

PLEASE CALL FOR MORE ROHN PRICES.

US TOWER

MA40/MA550	$1099/1699
MA770/MA850	$2799/4349
TMM433SS/HD	$1479/1789
TMM541SS	$1939
TX438/TX455	$1379/1899
TX472/TX489MDPL	$3139/8239
HDX538/HDX555	$1649/2889
HDX572MDPL	$7549

PLEASE CALL FOR HELP SELECTING A US TOWER FOR YOUR NEEDS. SHIPPED FACTORY DIRECT TO SAVE YOU MONEY!

COMET ANTENNAS

GP15, 6m/2m/70cm Vertical	$159
GP6, 2m/70cm Vertical	$149
GP9, 2m/70cm Vertical	$189
B10NMO, 2m/70cm Mobile	$39
SB14, 6m/2m/70cm Mobile	$59
SBB224NMO,2m/220/70cm	$69
SBB2NMO, 2m/70cm Mobile	$39
SBB5NMO, 2m/70cm Mobile	$55
SBB7NMO, 2m/70cm Mobile	$69
UHV4/UHV6	$109/149

MORE COMET ITEMS IN STOCK—CALL.

M2 ANTENNAS

50–54 MHZ

6M5X/6M7JHV	$209/269
6M2WLC/6M9KHW	$459/499

10/12/15/17/20M MONO

10M4DX, 4 Element 10m	$399
12M4DX, 4 Element 12m	$399
15M4DX, 4 Element 15m	$449
17M3DX, 3 Element 17m	$399
20M4DX, 4 Element 20m	$529

MORE M2 IN STOCK–PLEASE CALL.

GLEN MARTIN ENGINEERING

HAZER ELEVATORS FOR 25G

H2, Aluminum Hazer, 12 sq ft	$359
H3, Aluminum Hazer, 8 sq ft	$269
H4, HD Steel Hazer, 16 sq ft	$339

ALUMINUM ROOF TOWERS

RT424, 4 Foot, 6 sq ft	$159
RT832, 8 Foot, 8 sq ft	$239
RT936, 9 Foot, 18 sq ft	$389
RT1832, 17 Foot, 12 sq ft	$519
RT2632, 26 Foot, 9 sq ft	$869

UNIVERSAL ALUMINUM TOWERS

4-40'/50'/60'	$539/769/1089
7-50'/60'/70'	$979/1429/1869
9-40'/50'/60'	$759/1089/1529
12-30'/40'	$579/899
15-40'/50'	$1019/1449
23-30'/40'	$899/1339
35-40'	$1569

BOLD IN PART NUMBER SHOWS WIND LOAD CAPACITY. PLEASE CALL FOR MORE UNIVERSAL MODELS. SHIPPED DIRECT TO YOU TO SAVE YOU MONEY.

DIAMOND ANTENNAS

D130J/DPGH62	$79/139
F22A/F23A	$89/119
NR72BNMO/NR73BNMO	$39/54
NR770HBNMO/NR770RA	$55/49
X200A, 2m/70cm Vertical	$129
X500HNA/X700HNA	$229/369
X510MA/510NA	$189/189
X50A/V2000A	$99/149
CR627B/SG2000HD	$99/79
SG7500NMO/SG7900A	$75/112

MORE DIAMOND ANTENNAS IN STOCK.

MFJ

259B, Antenna Analyzer	$219
269, Antenna Analyzer	$299
941E, Antenna Tuner	$109
945E, Antenna Tuner	$99
949E, Antenna Tuner	$139
969, Antenna Tuner	$169
986, Antenna Tuner	$289
989C, Antenna Tuner	$309
1798, 80–2m Vertical	$249
1796, 40/20/15/10/6/2m Vert	$199

BIG MFJ INVENTORY— PLEASE CALL.

COAX CABLE

RG-213/U, (#8267 Equiv.)	$.36/ft
RG-8X, Mini RG-8 Foam	$.19/ft
RG-213/U Jumpers	Please Call
RG-8X Jumpers	Please Call

CALL FOR MORE COAX/CONNECTORS.

TIMES MICROWAVE LMR® COAX

LMR-400	$.59/ft
LMR-400 Ultraflex	$.89/ft
LMR-600	$1.19/ft
LMR600 Ultraflex	$1.95/ft

TOWER HARDWARE

3/8"EE / EJ Turnbuckle	$11/12
1/2"x9"EE / EJ Turnbuckle	$18/19
1/2"x12"EE / EJ Turnbuckle	$21/22
3/16" / 1/4" Big Grips	$5/6

PLEASE CALL FOR MORE HARDWARE.

HIGH CARBON STEEL MASTS

5 FT x .12" / 5 FT x .18"	$35/59
10 FT x .18" / 11 FT x .12"	$129/80
16 FT x .18" / 14 FT x .12"	$179/109
19 FT x .12" / 21 FT x .18"	$129/235
22 FT x .25" / 24 FT x .25"	$349/379

GAP ANTENNAS

Challenger DX	$289
Challenger Counterpoise	$29
Challenger Guy Kit	$19
Eagle DX	$299
Eagle Guy Kit	$29
Titan DX	$329
Titan Guy Kit	$29
Voyager DX	$409
Voyager Counterpoise	$49
Voyager Guy Kit	$45

PLEASE CALL FOR DELIVERY INFO.

LAKEVIEW HAMSTICKS

9106	6m	9115	15m	9130	30m
9110	10m	9117	17m	9140	40m
9112	12m	9120	20m	9175	75m

All handle 600W, 7' approximate length, 2:1 typical VSWR .$24.95

HUSTLER ANTENNAS

4BTV/5BTV/6BTV	$129/169/199
G6-270R, 2m/70cm Vertical	$169
G6-144B/G7-144B	$109/179

HUSTLER RESONATORS IN STOCK.

ANTENNA ROTATORS

M2 OR-2800P	$1249
Yaesu G-450A	$249
Yaesu G-800SA/DXA	$329/409
Yaesu G-1000DXA	$499
Yaesu G-2800SDX	$1089
Yaesu G-550/G-5500	$299/599

ROTATOR CABLE

R62 (#18)	$.32/ft.
R81/82	$.25/ft./.39/ft.
R84	$.85/ft

PHILLYSTRAN GUY CABLE

HPTG1200I	$.45/ft
HPTG2100I	$.59/ft
PLP2738 Big Grip (2100)	$6.00
HPTG4000I	$.89/ft
PLP2739 Big Grip (4000)	$8.50
HPTG6700I	$1.29/ft
PLP2755 Big Grip (6700)	$12.00
HPTG11200	$1.89/ft
PLP2758 Big Grip (11200)	$18.00

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GREAT US TOWER CRANK-UP DEALS!

TX SERIES CRANK-UP TOWERS

• Handles 35 square feet of antenna load at 50 MPH, 14.75 square feet at 70 MPH.

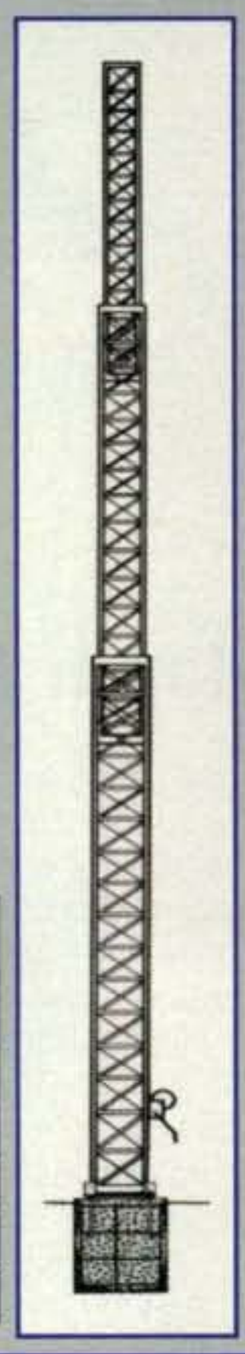
• All models supllied with hinged T-base, anchor bolts, hand winch (except motor drive models), top plate, and rotor plate.

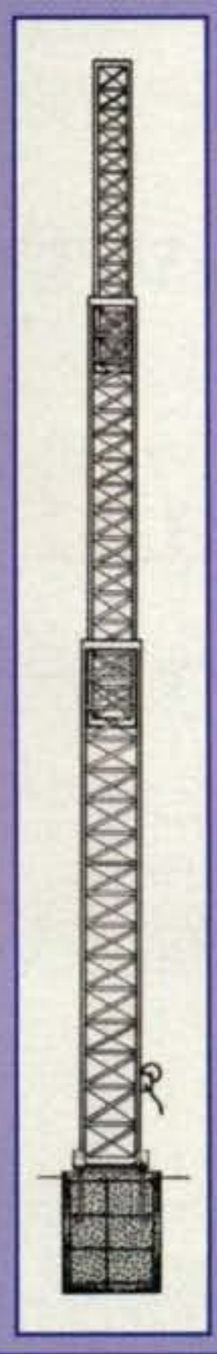
• MDP & MDPL models include motor drive

• Options include coax arms, raising fixtures, masts, motor drives, and more!

Now shipping from CA for west coast customers, and KS for east coast and midwest customers, to reduce freight cost!

TX SERIES HEAVY DUTY CRANK-UP TOWERS					
TOWER MODEL	MAX. HT.	MIN. HT.	WT. (LBS.)	LIST PRICE	SALE PRICE
TX-438	38'	21'6"	355	$1,523	$1,379
TX-455	55'	22'	670	$2,107	$1,899
TX-472	72'	22'8"	1040	$3,462	$3,139
TX-472MDP	72'	22'8"	1210	$5,571	$5,049
TX-489MDPL	89'	23'4"	1800	$9,034	$8,239





HDX SERIES CRANK-UP TOWERS

• Heavy duty, handles 44.7 square feet of antenna load at 50 MPH, 35 square feet at 70 MPH.

• All models supllied with hinged T-base, anchor bolts, hand winch (except motor drive models), top plate, and rotor plate.

• MDPL models include motor drive

• Options include coax arms, raising fixtures, masts, motor drives, and more!

Now shipping from CA for west coast customers, and KS for east coast and midwest customers, to reduce freight cost!

HDX SERIES HEAVY DUTY CRANK-UP TOWERS					
TOWER MODEL	MAX. HT.	MIN. HT.	WT. (LBS.)	LIST PRICE	SALE PRICE
HDX-538	38'	21'6"	600	$1,807	$1,649
HDX-555	55'	22'	870	$3,162	$2,889
HDX-572MDPL	72'	22'8"	1600	$8,281	$7,549
HDX-589MDPL	89'	23'8"	2440	$10,841	$9,899
HDX-689MDPL	89'	23'8"	3450	$20,943	$19,129
HDX-5106MDPL	106'	24'8"	3700	$22,791	$20,799

MA SERIES CRANK-UP MASTS

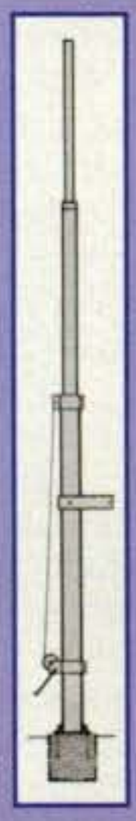
• Handles up to 22 square feet of antenna load. (See chart below)

• MDP models include motor drive.

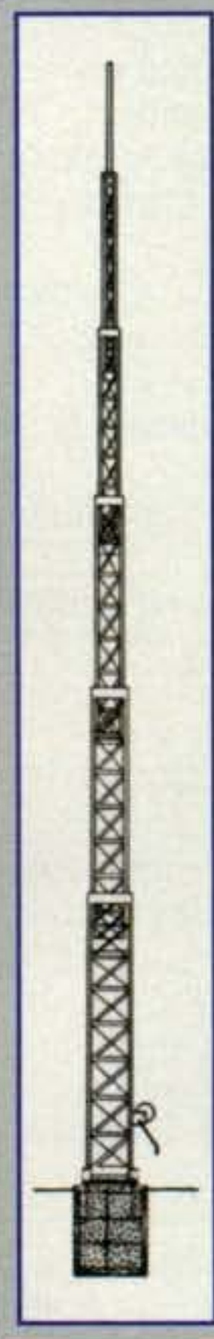
• All models supllied with anchor bolts, load-actuated hand winch, and house bracket.

• Options include coax arms, raising fixtures, motor drives, self-supporting and rotator bases, remote control panel, and more!

Now shipping from CA for west coast customers, and KS for east coast and midwest customers, to reduce freight cost!



MA SERIES CRANK-UP MASTS							
MAST MODEL	MAX. HT.	MIN. HT.	WT. (LBS.)	50 MPH (sq. ft.)	70 MPH (sq. ft.)	LIST PRICE	SALE PRICE
MA-40	40'	21'6"	242	16.5	6.8	$1,209	$1,099
MA-550	55'	22'1"	435	22	9	$1,875	$1,699
MA-550MDP	55'	22'1"	620	22	9	$3,584	$3,249
MA-770	71'	22'10"	645	15.5	5.5	$3,091	$2,799
MA-770MDP	71'	22'10"	830	15.5	5.5	$4,890	$4,449
MA-850MDP	85'	23'6"	1128	15.3	6.3	$6,591	$5,999



TMM SERIES COMPACT CRANK-UP TOWERS

• Handles 20 square feet of antenna load at 50 MPH, 8 square feet at 70 MPH.

• Compact design is great for areas with tower restrictions, or where a less intrusive installation is desirable.

• All models supllied with hinged T-base, anchor bolts, load-actuated hand winch, 8' steel mast, top plate, and rotor plate.

• Options include coax arms, raising fixtures, motor drives, thrust bearing, remote control panel, and more!

Now shipping from CA for west coast customers, and KS for east coast and midwest customers, to reduce freight cost!

TMM SERIES COMPACT CRANK-UP TOWERS					
TOWER MODEL	MAX. HT.	MIN. HT.	WT. (LBS.)	LIST PRICE	SALE PRICE
TMM-433SS	33'	11'4"	315	$1,626	$1,479
TMM-433HD	33'	11'4"	400	$1,970	$1,789
TMM-541SS	41'	12'	430	$2,135	$1,939

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Complete Rules:

The "CQ/60" Operating Activity and the "CQ Gang Award"

January 1 – March 1, 2005

CQ magazine will celebrate its 60th anniversary with next month's issue, and you're invited to join our on-air party! We'll be celebrating with a special "CQ/60" operating activity and "CQ Gang" award program announced last month (see November issue, p. 99). Here are the complete rules:

The *CQ* Gang Award

Eligibility

1. Any radio amateur or shortwave listener anywhere in the world may participate in this award program.

2. The following amateurs are authorized to sign "/60" after their callsigns as part of this program, between January 1, 2005 and March 1, 2005:

(a) Current and former staff members, columnists and writers for *CQ Amateur Radio* magazine or its sister publications, *CQ VHF* and *Popular Communications*, along with titles formerly published by CQ Communications Inc., including *Communications Quarterly* and *CQ Contest*.

(b) Current and former *CQ* Award Managers, Contest Directors, award and contest committee members, and *CQ* award checkpoint stations.

(c) Authors of *CQ* books; production staff and participants in *CQ* videos.

(d) Any other current or former employees of CQ Communications Inc.

(e) Current subscribers to *CQ Amateur Radio, CQ VHF* and/or *Popular Communications* magazines.

Award Rules

1. All contacts/receptions must be made between 0000 UTC January 1, 2005 and 2359 UTC March 1, 2005.

2. Contact (or monitor) stations signing "/60" after their callsigns in accordance with these rules. "/60" stations may contact any stations, including other "/60" stations.

3. A minimum of 60 award points must be earned to qualify, with endorsements available for each additional 60 award points, up to a maximum of 600 points. (Please submit a single application for the basic award and any endorsements. Separate endorsement applications will not be accepted.)

4. Award points are determined as follows:

(a) All stations: Each contact with a "/60" station is worth one contact point. Each separate title (see box) is worth one multiplier, except that the titles listed in (c) below are worth two multipliers. Each multiplier counts only once. Score is determined by multiplying the number of contacts by the number of multipliers. (e.g., 10 contacts with /60 stations with 6 different titles = 60 award points; 10 contacts with /60 stations with 6 different titles, including one bonus station = 10 × 7=70 award points.)

(b) "/60" stations: As above, plus one (1) point per valid contact with a "non-/60" station. There is no additional multiplier value for "non-/60" stations. (e.g., 10 contacts with /60 stations with 6 different titles + 30 contacts with "non /60" stations = 40 contact points × 6 multipliers = 240 award points.)

(c) Bonus points: The following titles carry double multiplier value:

Publisher (PUB)
Editor (ED)
Managing Editor (MED)
CQ club station WW2CQ (CQ) (see "WW2CQ Special Operation" for additional information)

5. Exchange

(a) "/60" stations: Transmit your callsign, name, QTH, signal report, and position held (see box). If status is "former," please indicate; this does not affect multiplier value. (e.g., Phone: "W2VU/60, name is Rich, QTH is New Jersey, you are 59 and position is 'Editor,' Echo Delta." CW: "de W2VU/ 60, Rich in NJ, UR 599, ED")

(b) All other stations: Transmit your callsign, name, QTH (US state, VE province or DX country) and signal report. (e.g., "W2VU, name is Rich, QTH is New Jersey, and you are 59." CW: "de W2VU, Rich in NJ, UR 599...")

(c) All stations: Additional exchanges of personal information (a real "QSO") are encouraged when conditions permit.

6. Each "/60" station may be contacted once per band and mode for award credit (see "WW2CQ Special Operation" for exception regarding club station WW2CQ), but each multiplier counts only once. The use of repeaters, satellites and digital store-and-forward systems **is** permitted, as are contacts made via Internet repeater-linking systems, provided both stations are using radios transmitting in the amateur bands. (Internet-to-internet and radio-to-internet QSOs are not valid; wireless LANs are not considered radios unless part of an all-RF wireless network.)

7. QSL cards are *not* required. Applications must be accompanied by log extracts indicating date, time, band and mode for each contact, plus the required exchange information (see rule 5 above).

8. Log submissions

(a) Computerized logs **in Cabrillo format** (most current logging programs will generate a Cabrillo format log file for you) may be submitted by e-mail to: <**cqmag60@cqww.com**>. *Do not send logs for any regularly scheduled CQ contest—such as the CQ WW 160 Meter Contest—to this address.*

Be sure to fill in the Cabrillo header information (e.g., name, address, call, etc.) before submitting your log. *Please note: This is the first time we'll be using the CQ contest log "robot" for non-contest log submissions. We hope everything will run smoothly but keep copies of everything and please bear with us in the event of any unanticipated bugs in processing.*

(b) Non-Cabrillo logs may be e-mailed to CQ Awards Editor Ted Melinosky, K1BV, at <k1bv@cq-amateur radio.com>. Be

Who's Who at CQ

Following is an alphabetical list of the various titles held by "*CQ* Gang" members you might meet on the air, along with the abbreviations (in parentheses) required for multiplier credit. "*CQ* Gang" members with more than one title should choose only one to use for award contacts. Titles carrying **double multiplier value** are in **bold**.

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Author [books] (AUT)
Award Checkpoint (CHK)
Award Committee (AC)
Award Manager (AM)
Columnist/Contributing Editor (COL)
Contest Committee (CC)
Contest Director (CD)
***CQ* Club Station WW2CQ (CQ) (see "WW2CQ Special Operation")**
Editor (ED)
Managing Editor (MED)
Photographer (PIX)
Publisher (PUB)
Subscriber (SUB)
Video Production Staff or Participant (VID)
Writer [Magazines] (WR)
Other *CQ* staff/associates not listed above (CQS)

sure to include your name, call, address, etc. in covering e-mail message.

(c) Paper logs should be mailed to K1BV at 12 Wells Woods Road, Columbia, CT 06237. Forms for paper logs may be downloaded from the CQ website <www.cq-amateur-radio.com> or requested by mail from CQ magazine, 25 Newbridge Rd., Hicksville, NY 11801. Include an SASE.

9. Completed applications must be submitted by March 31, 2005. A single submission for all qualifying contacts is required. Separate applications for endorsements will not be accepted.

10. Awards: A certificate will be issued to each participant who has achieved at least 60 award points. Endorsement stickers will be issued *with the certificate* for each additional 60 award points, up to a maximum of 600, included on the original application.

11. There is no fee for this award.

WW2CQ Special Operation

As announced last month, various members of the CQ "family" will be activating the CQ club station, WW2CQ, from different parts of the country during the activity period from January 1 to March 1, 2005. They will sign WW2CQ/61 from the first call area through WW2CQ/60 in the zero call area. Each contact with WW2CQ in a different call area will count as a separate contact for the CQ Gang Award (bonus points, too), so you may contact WW2CQ up to ten times (once in each call area) for award credit. If you contact WW2CQ in *all ten US call areas*, submit a separate log extract (paper log or e-mail listing only, showing date, time and frequency of each contact, to K1BV's e-mail or snail address) for a special additional certificate.

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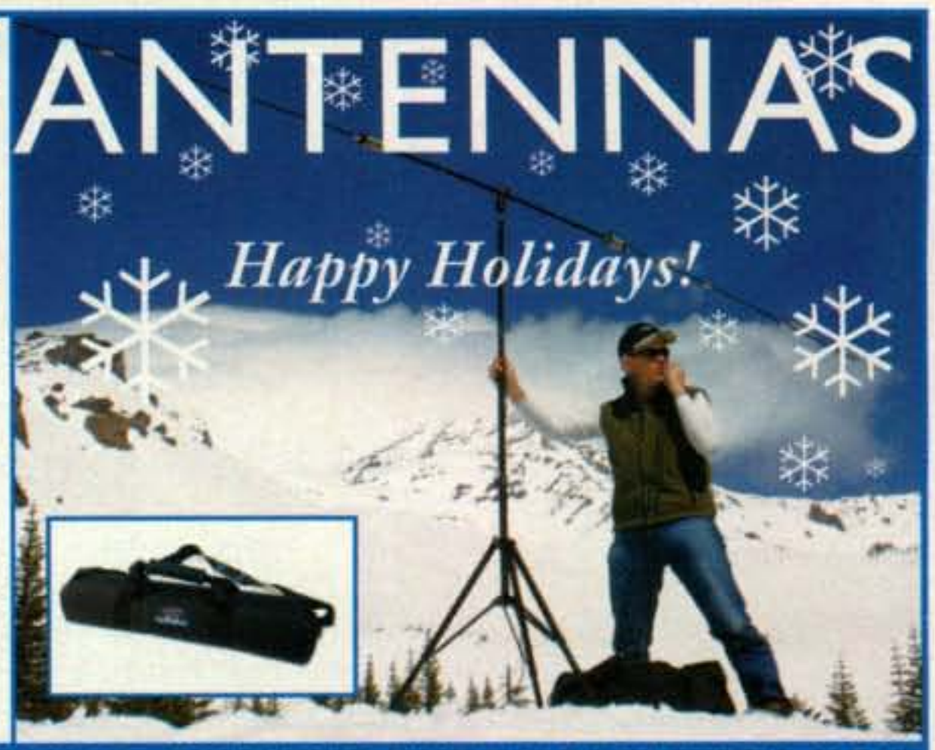

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Results of the 2004 CQ WW DX 160 Meter Contests

By DAVID L. THOMPSON,* K4JRB

The CQ WW 160 Meter CW and SSB Contests have grown from sleepy little contests on a lightly used band (some of us could not even use the band before 1970) to the 2004 running with a *record 2106 logs received*! The CW section alone had 1330 entries plus 30 check logs, which equals the number of logs received by the ARRL CW Sweepstakes. The number of CW logs jumped nearly 20 percent from last year's record. SSB logs increased from 519 to a record 722 this year.

While a record number of logs were received, contestants found conditions mixed. Some found great conditions, while Jeff VY2ZM/K1ZM, said 2004 was poor from his Prince Edward Island super station. Steve, VK6VZ, traveled from Western Australia to help operate VY2ZM, and while conditions were not good, he did manage to work more Europeans in an hour than he did in an entire contest from VK6.

Individual scoring records were set, and we are still a couple of years away from the sunspot minimum when conditions will peak. UU7J worked 89 DXCC entities, and over 150 different entities were available on either mode (*entities* are what countries are now called). Expect to see DXCC worked over a weekend and some European or African station to reach all 50 states soon.

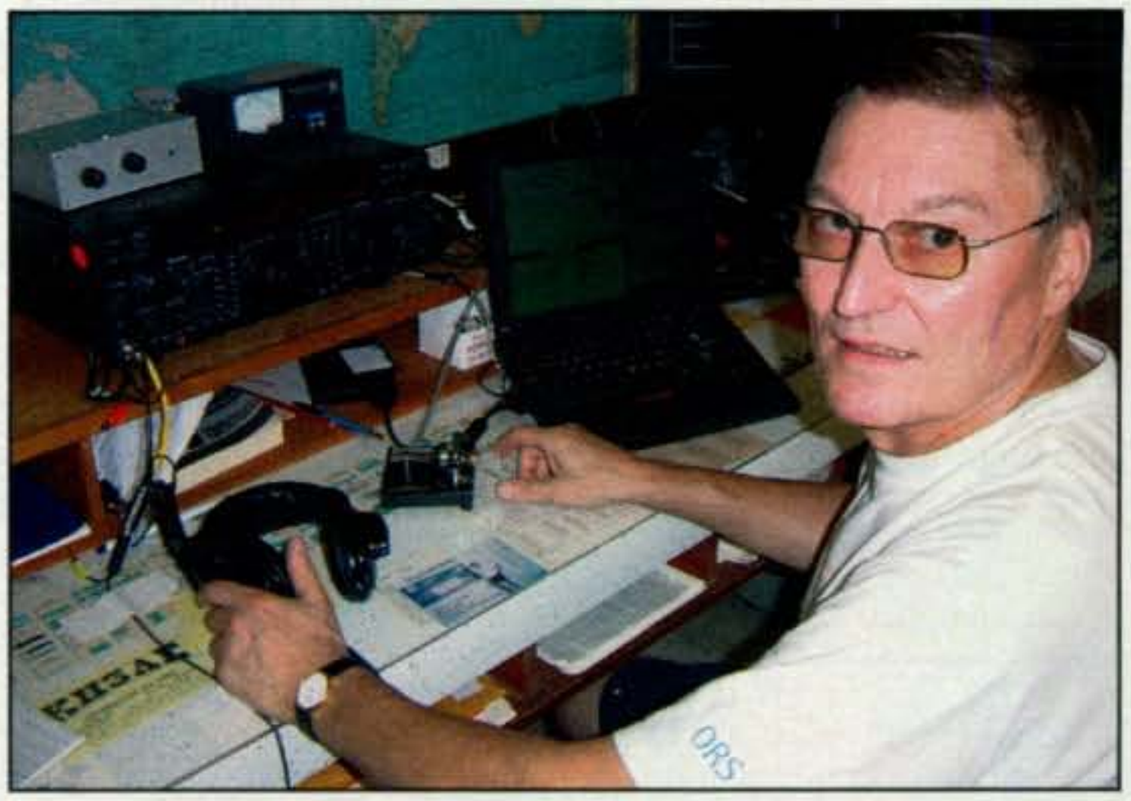
The SSB section is a relative newcomer to the CQ 160 contest fold. It was started in 1981 by then 160 Contest Director Don McClenon, N4IN (SK) thanks to demand for an SSB section. There have some astounding scores on SSB over the years, and a couple of times the highest score in both sections combined was on SSB. However, with a limited band outside North America, scores usually don't match up with CW. What will improve the contest is for all IARU countries to get together and ask their governments for a worldwide band from 1800 to 1900 kHz. Then the IARU/ARRL gentleman's band plans can be implemented. Here in North America it is not unusual for stations to operate up to 1950 kHz. The CQ contest is still the only worldwide 160-meter SSB contest. Let's get the band fixed so we all can be happy!

Please note that the station operators of Multi-Op stations and the Guest Operators box have been moved to the web. Go to <www.cq-amateur-radio.com>, to the Contests section, to the 2004 Expanded CQ WW 160 Meter Contest results.

CW

OH2PM operating EA8BH nearly broke 2 million points for the highest score ever made in the contests. He beat the existing high score by well over 400K. D4B and PJ2S also made over 1 million points on CW single operator. The late W4AN topped USA entries from the W8JI super station, and frequent competitor VE3EJ was top Canadian with a fine score. S53R at A61AJ beat the old Asia record and also nearly broke 1 million points. Some North American contestants were surprised at his signal strength compared to the Europeans on the band. D4B (op. 4L5A) went low power and also broke the existing low power record by a wide 500K margin. He almost tripled the score of his nearest competitor. This year's hardest working awards go to Paul, N4PN, and Bob, W4MYA, for making the USA top 10 on both modes. A round of new finals for both!

New this year is the RZ3AA Russia plaque won by UA6LV. OM7DX won world high CW QRP, and Don, K8MFO, topped the USA QRP entries plus placed third world. All of top QRP entries scored well compared to many low power entries. G4RCG/HI8 was runner up to D4B in low power, and K1PX again was the USA low power winner. Good antennas and patience are required to make the low power and QRP lists.



Pertti, OH2PM, broke the CW world all-time single-op record from EA8BH.

Laki and crew operated VP5/VE3NE to the world high multi-operator position. The CW multi-op race was very close, with four stations scoring just over 1 million points. A scant few QSOs or a multiplier or two were all that separated first from fourth place. VY2ZM with nearly 773K was the top Canadian multi, and the W2GD crew keyed their way to high USA.

Thirty-four CW single-operator stations made more than 1000 QSOs. EA8BH (op. OH2PM) made the most with 1540, followed closely by W8JI (W4AN) with 1495. SO2R worked the most DXCC with 82, and DXCC again was dominated by Europe. W8JI (67) and W4ZV (61) were the top North Americans. Making a big DX score depends on working USA and Canadian multipliers. EA8BH and D4B were the most efficient, logging 51. KH7X logged 50 from Hawaii, and CT1FJK led Europe with 40. Forty-one multi-operator stations made over 1000 QSOs. The gang at MD4K almost broke WB9Z's QSO (1775) record with 1760. W2GD (1224) led the USA. UU7J worked the most DXCC with 89. It took 79 to make the top 10. On this side of the ocean,VY2ZM (66) and W2GD (62) led the way. VP5/VE3NE worked the most states and provinces with 55. 9A5Y and F6IRA led Europe with 40, and I5JVA was close behind with 39. Look for the European USA/VE count to increase in the next few years.

Close CW single-operator races occurred in Utah, Kansas, Lithuania, the Netherlands, Poland, Portugal, Romania, Sweden, and the Ukraine. The margin of victory in Kansas was 498 points, and in the Netherlands, Lou, PAØLOU, won by 868 points.

For the CW multi-ops, Pennsylvania was a tight race among three veterans, with W3GH the winner. Croatia, the Netherlands, and Slovakia produced close races. The tightest race was between OM7M and OM8A in Slovakia. The difference was 169 points.

SSB

W7EJ made some improvements and led all SSB single operators this year. His neighbor, D4B, came in second with another fine effort. Jeff, VY2ZM, went solo and found SSB better this time, topping

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SINGLE OPERATOR
CW

WORLD BY W4ZV (DJ8WL MEMORIAL): Winner Martti Laine, EA8BH (OH2PM Operator)
USA BY K4TEA: Winner Charles T. Rauch Jr. W8JI (W4AN Operator)
CANADA BY K8FC: John Sluymer, VE3EJ
ZONE 3 BY N5IA: Winner Ken Keeler, N6RO
ZONE 4 BY K4WA: Winner James F. S. Eppwright, K5RX
ZONE 5 BY N4PN: Winner Jon Zaimes, AA1K
AFRICA BY WS9V: Winner Alexander Teimurazov, D4B (4L5A Operator)
ASIA BY K4SX: Winner Ali Al-Futtaim, A61AJ (S53R Operator)
EUROPE BY K9DX: Winner Krzysztof Sobon, SN7Q (SP7GIQ)
RUSSIA BY RZ3AA: Winner Vlad Lesnichy, UA6LV
OCEANIA BY K9DX: Winner Pacific Contest Club, KH7X (Operator KH6ND)
SOUTH AMERICA BY W4NU (W4UUH Memorial): Winner Steve Knell, PJ2S (GØCKP)
JAPAN BY W4ZV (JA1XAF Memorial): Winner Masaki Okano, JH4UYB
NORTH AMERICA BY CQ (N4IN Memorial): Winner Herbert Schoenbohm, KV4FZ

PHONE

WORLD BY N4NX: Winner James P. Sullivam, CN2R (W7EJ)
USA BY K4JRB: Winner Jerry Rosalius, WB9Z
CANADA BY WØETC: Winner Jeffrey T. Briggs, VY2ZM (K1ZM)
ZONE 3 BY N4TMW: Winner LaMar Ray, WA7LT
ZONE 4 BY N4XMX: Winner James F. S. Eppwright, K5RX
ZONE 5 BY K1PX: Winner Robert S. Morris, W4MYA
AFRICA BY WB4ZNH: Winner Alexander Teimurazov, D4B (4L5A)
ASIA BY NT4TT/AH2BE: Winner Valentin Benzar, C4M
EUROPE BY WS9V: Winner Rolandas Jokubauskas, LY4A (LY2FY)
OCEANIA BY D4B/4L5A: Winner No Entry.
SOUTH AMERICA BY D4B/4L5A: Winner John Crovelli, P40W (W2GD)
NORTH AMERICA BY CQ (K2EEK Memorial): Winner Alexander Aimette, V47KP (W2OX)

MULTI-OPERATOR
CW

WORLD BY N4RJ: Winner Lajos Laki, VP5/VE3NE
USA BY W8UVZ and K8GG: Winner John Crovelli, W2GD
ZONE 3 BY 4X4NJ: Winner Jim Wilson, N7JW

SSB

WORLD BY SOUTHEASTERN DX CLUB: Winner Bud Foster, VP5B (K4ISV)
USA BY WB9Z: Winner South Jersey DX Association, N2CW
ZONE 3 BY 4X4NJ: Winner Jacks Peak Amateur Radio Association, N7GP

Steve, NR4M at CW multi-operator station NR4M in Virginia.

The tractor-mounted antenna for packet at CW multi station NR4M.

Canada and placing third world high. Jerry, WB9Z, assumed his usual place at the head of the USA entries, followed closely by Bob, W4MYA. VE3MGY (ex-VY2MGY/VE3) again topped the QRP entries by a wide margin. Newcomer UR4MBI placed second in QRP from QRP U (the Ukraine). KP4KE operated by DK8ZB ran away with low power. He made the overall top 10 as well. NØFW again made a fine effort and led the USA entries. HI3TEJ placed third plus gave out a good multiplier.

Nine different SSB single operator stations made over 1000 QSOs. WB9Z with 1542 was the leader. W4MYA (1333) and VY2ZM (1237) were second and third, respectively. LY4A (op. LY2FY) worked 73 DXCC entities to lead everyone on SSB. CN2R and D4B were close behind with 70. On this side, VY2ZM (57) was the Canadian leader, with W4MYA topping the USA with 40. Close by, KP4KE worked 55 states and provinces ahead of P40W and KV4FZ with 53. DX leaders were D4B (47) and CN2R (44). Top European was again CT1FJK with 30.

K4ISV and the crew at VP5B led the SSB multi-operators, beating past trophy winners UU7J and XE1RCS. Vic at XE1RCS says this was their best year, and in Europe their call lit up the packet spots. Also making the top 10 world-high multi-operator list were Canadian leader VE3DC and the South Jersey gang at N2CW with the high USA score. UU7J led the QSO count with 1396. More than 11 multi-operator stations make over 1000 points. UU7J also made the highest DXCC count at 78, with N2CW leading the USA with 42. The top 10 was all Europe except for VP5B and XE1RCS. XE1RCS, being nearby, worked a DX high 56 states and provinces, followed closely by VP5B (55). Multipliers were harder to get in Europe, with EI7M (29) and DL6FBL (28) leading the way. Expect to see these numbers rise over the next few years.

Close SSB single-operator races occurred in New York, North Carolina, Wisconsin, Bulgaria, Italy, and the Ukraine. Actually, Wisconsin was a three-station race, with K9UW winning by a mere 685 points. The only SSB multi-operator race that was close was in Kentucky.

Clubs

Last year's runner up, the Bavarian Contest Club (BCC) geared up the troops and blew away the competition with a record 12.5 million club score. This is the first club score over 10 million. The Potomac Valley Radio Club (PVRC) held second place with a score of 8.36 million. The Frankford Radio Club was not far behind in third with 7.57 million. The Slovenian Contest Club and Contest Club Ontario tookfourth and fifth places, with Contest Club Ontario just beating out the Yankee Clipper Contest Club. It took a score of over 3 million to make the top 10, and 25 clubs scored over 1 million points.

Want to get your club on the list? Why not get your gang out in 2005? Remember that DXpeditions by club members count for the club score, and this has been leveraged well in the past. Only clubs with three or more entries are included.

Logging Notes

The contest robot at kkn.net expects a Cabrillo log. In 2004 we only checked the summary, but in 2005 we will check the first QSO line. About 70 logs were found not to be fully Cabrillo, which really slows down the log-checking process. Please make sure your logging program or converter produces good Cabrillo, and please do not try to home-brew your own. Any log that is electronically produced *must* be sent via diskette or e-mail. In 2004 three Cabrillo printed logs and a number of traditional printed logs were received with no electronic backup. We need every electronic log to assure that the scores are correct and the cross-check is accurate. We will convert old logs if need be to get the results we all want. Logs received in the mail that are comput-

er-generated must have a diskette included or they will be rejected as a check log! Handwritten logs will still be accepted.

Some of the scores you see here may be lower, and getting a better cross-check sample is the reason. We also now can more easily identify uniques that are really busted callsand remove them. Please take the time to make sure everything is correct. We also ran into a problem on portable calls. We do not care what the station sends; just make sure you log it as sent! Log it as sent or lose it!

One final point: We use the claimed score in the Cabrillo summary as a benchmark and to display the claimed scores. Leaving it blank is a mistake. Thanks to Eddie, W6/ GØAZT, Jim, AD1C, and others for their help in making the results as accurate as possible.

Certificates and Plaques

Every so often the rules for plaques and certificates are changed to meet conditions. Only one plaque per section is awarded per entrant. The runner-up gets a plaque for country or continent. No plaque is awarded for a score of less than 30K. Minimums for low power and QRP certificates are 5K for low power and 1K for QRP. Exceptions are made by CQ 160 Contest Committee decision (Japan Low Power, for instance). The CQ 160 Contest Committee or the Contest Director may decide to not award a certificate if the effort is not shown (usually a very low score). A runner-up in a state, province, or country may be awarded a second-place certificate if there are eight or more entries and the score is 100K or more. Please have patience, as volunteers handle all plaques and certificates.

The 2005 Contests

The dates for the 2005 CQ WW 160 Meter Contests are set for CW January 29–30 and SSB February 26–27. The contests run from 0000Z the first date to 2359Z the second date. Logs for the 2005 contests may be submitted as hand logs to *CQ* via snail mail or in Cabrillo format via e-mail to the addresses shown below. You may also submit electronic logs on diskette (3.5 inch, please).

We must hold everyone to our required log-submission deadlines of February 28, 2005 for CW or March 31, 2005 for SSB. The exception is if both logs are submitted together, and then the date is March 31, 2005. If you submit both logs at the same time, please use two separate e-mails, not two attachments to one e-mail. Snail-mail logs must bear a postmark no later than the deadline for consideration.

Send logs to CQ 160 Meter Contest, 25 Newbridge Rd., Hicksville, NY 11801, or via e-mail. This year CW logs go to <160cw@kkn.net> and SSB Logs go to <160ssb@kkn.net>. Remember to put your call in the subject area of the e-mail. Mark snail-mail logs as either CW or SSB. Good luck in the 2005 contests! 73, Dave, K4JRB

CW QRM W/VE

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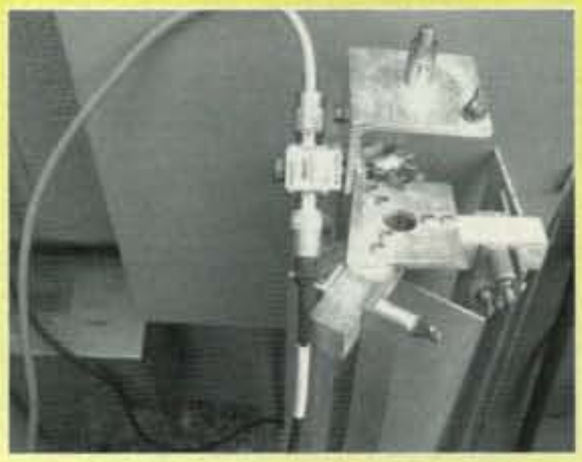

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K1BV. Never tried contesting before. What a rush ... **KM1N.** Beverage antenna began giving louder signals than my inverted-L. I knew the ice storm had done me in ... **N2FY.** PC glitch forced us back to hand logging. Boy, what a chore ... **W1OP.** 160 operators still have great courtesy ... **W4OGG.** RST exchange is useless ... W5XW. Thanks to D4B for a new DXCC entity and CQ zone on Top band ... **WB4DNL.** Took 20 calls to work my buddy at PRØF ... **W5EUQ.** Activity on 160 reminded me of 40 meter CW in the late 1950s ... **W5CN.** A thrill to work old friends ... **K8XF.** Everyone was so polite and helpful ... It's "5NN CA TU" and away ... **KA6UMQ.** Worked every station I called except for an EA with 5 watts ... **W9PNE.** Limited time on due to the flu ... **WA9TZE.** Boy, it's hard to copy with strong power line noise ... **WØNFL.** Not sure which was worse, the absorption on the band or the vegemite Steve, VK6VZ, brought from Australia. Actually, the vegemite just looked bad ... **VY2ZM.** More than 300 Europeans in the log ... **AA1K.** Rented a cabin in the Central Arizona mountains ... **AB7E.** Worked an EI on one call with 5 watts ... **AD8P.** Worked Alaska for my last state ... **K1DFT.** Antenna was a "Broomstick" mounted at 10 feet on a neighbor's fence ... **K1RQ.** Band was long both nights. Highlight was working A61AJ ... **K2FU**. N6KB sent "HI" which needed to be KH6 for logging ... **K3DI.** Ran just 950 mw from an Index Labs transceiver ... **K4PQC.** Lost several QSOs to a PC problem ... **K4RO.** The new contest times gives an unfair advantage to the East Coast with three evening openings to Europe. Start the contest at 2200Z again ... .**K5ZD** *(Sorry, but CQ wanted all contests to be uniform in starting and ending times—K4JRB).* Worked fewer JA's than two years ago. No Europe heard here but did work EA8 and D4 ... **K6NR.** Mostly a one night affair as high winds made the balloon-supported vertical almost horizontal ... **K6SE.** Contest conflicted with the ARRL January VHF Contest ... **K7AWB.**

Great contest but where was Alaska? ... **K7OA.** Thanks to the people who called but I could not copy this time. Next year I will have a low receiving antenna ... **K7RE.** I did something I have never done before —fell asleep at the rig. Slept 3-1/2 hours ... **K8FC.** Hard to hold a frequency with 100 watts ... **KA7T.** Thanks to W3LPL for letting me use his station and W9GE for the use of his new ORION. ... **KD4D.** Fabulous contest. Gets better every year ... **KT1V.** I operated from NØNI ... **NØAC.** Only could get in 11 hours ... **NØFW.** This was by far my best performance in the CQ 160. I have operated it from the first years as W4YWX and now N4PN ... **N4PN.** Europe was in early Saturday evening ... **N4UH.** Started 4 hours late. Conditions good, QRN lousy ... **N6CT**. Lost the amp one hour into the contest. Took another hour to get a replacement ... **N7KA.** Saturday was better for working Europe ... **N8BJQ.** Conditions were better than one year ago. My first hour rate was 135 Q's ... **N8II.** Band was in great shape here ... **NC7X.** Covenant restrictions make 160 contest operation especially challenging ... **NO2D.** First contest operation from the new NR4M QTH ... **NR4M.** We fixed the noise problem and were pleased to hear the DX ... **NZ1U.** Award for patience to A45XR ... V**E3PN.** Just got on to help with a few QSOs ... **VE3WZ.** Tough sledding on a small lot with S9 noise ... **VE7JKZ.** Great contest and conditions. I could get addicted to this ... **W1JQ.** Getting old, contest getting tougher, but still great fun ... **W3BGN.** My first use of a contest logger ... **W5TVW.** Ran QRP to a 6V6 homebrew transmitter. Used a variac to maintain 5 watts output ... **W7DRA.** This is the first time we scored more than 300K from Battle Creek (Michigan) ... **W8UVZ**

CW QRM DX

Work contests for fun and new counters ... **DLØVLA (op. DL1JFM).** DL limit is 75 watts so how do some run 1KW? ... **DL6RO.** My longest antenna is for 80. It's hard work with such an antenna and low power ... **EA4DUT.** No USA worked yet ... **HL5UOG.** We had a strong electrical storm that made reception difficult ... **KH6GP.** Had to force feed my R7000 vertical on 160 ... **OH2OM.** I was called by PRØF for a new one on Top band ... **PAØLOU.** No aurora, no QRN, just no good propagation ... **UA9FAR.** More serious vacation than contest operation ... **C6AYB (op. K3BU).** Had rig problems so had to QRT, but back next next year ... **CO8ZZ.** New 2-element vertical is a dream ... **CT1FJK.** First multi with the new vertical ... **DJ6TK.** Operated from the old Armed Forces Network site in Munich ... **DJ5IW.** It is possible to work the contest from downtown Paris with a 25 meter antenna ... **F6GOX.** I did not make the second night and my dreams went out ... **FM5GU.** Only managed a few hours due to the XYL's birthday ... **G3SVL.** The second day was running Europe with 100 watts between loud W's ... **G4RCG/HI9.** Thanks again to Carlo's family ... **I5JVA (op. IK2QEI).** A lot of fun even with my low dipole ... **IK2PFL.** Score not so good this year

Steve, VK6VZ, operating multi-op station VY2ZM during the CW contest.

... **JAØZRY.** Good to be back in the CQ 160 ... **JA5DQH.** At sunset in Japan, N7JW was 599+. But no Europeans heard this year ... **JE1SPY.** Great contest again plus I had strong competition ... **JH4UYB.** Fun contest but my transmit vertical was not a very good receiving antenna. Back next year with a receiving antenna as well ... **LA7AK.** We had a good first day with 600 QSOs but lost the antenna the last night. Oh well, back next year ... **LX7I.** Just a part-time effort this year ... **LY3BA.** This is one of the best contests each year ... **M3C (op. GØVQR).** Good fun with a puny HF6VX vertical ... **MMØACC.** Band was crowded in Europe. Had high SWR that limited power to 70 watts ... **OLØA (op. OK1CZ).** First contest from this QTH. Inverted-V at only 13 meters high ... **OL8R.** Very unsportsmanlike behavior from several stations ... **ON4WW.** The 1000 foot Beverage worked great ... **PJ2S (op. GØCKP).** Lost the linear in the contest. Worked first KH6 from PYØF ... **PRØF (op. W5SJ).** We need a better antenna for Top band. May put up a 3-element wire beam fixed on USA ... **RU1A.** Most QSOs and best score ... **S57M.** Just made a 160 meter trapped inverted-V. Good way to test it ... **TK5MH.**

SSB QRM W/VE

Minimum antenna system = marginal performance ... **K1EY.** Participants were well behaved this year ... **K1HAP.** Great band conditions for QRP ... **K3TW.** Worked W4MYA for my first 160 contact ever ... **KB1CIW.** Most 160 QSOs I have ever made ... **N1ZN.** When I worked WL7YN I thought I had finally worked Alaska for the 50th state for 160 WAS. Then found he was portable nearby ... **N2FY.** I passed my Extra exam on Friday. Many contacts congratulated me ... **W1MKY.** Finally worked Kansas on 160 ... **W2JUV.** Most DXCC worked on 160 ... **W4SVO.** I was amazed at how well my QRP SSB worked. Almost as well as my CW operation ... **W4TMR.** Worked K9IDQ for about 5 minutes before logging the contact ... **WB4UIC.** Excited to find out my TS2000 performs well in a contest ... **WI2Q.** Hope to get up a better DX antenna next time ... **AF1T.** It's great to feel the heat and smell the tubes in my TS830S ... **KBØARZ.** Working VP5B with almost no power and no antenna ... **KKØQ.** Wish the contest was in early February ... **N8XA/QRP.** Working FM5 and bettering my personal best number of contacts ... **W8KNO.** Great time as always but where were KH6 and DC? Next year a DXpedition to either North Dakota or DC ... **WA9TZE.** This is the last year for a paper log but how do you cure RFI? ... **WB9NOO.** Worked all day Saturday getting the antenna in the trees and it worked great ... **VA7MJR.** All QSOs were made above 1843 kHZ in keeping with the ARRL 160 meter band plan ... **AA1K.** Was able to operate about 13 hours ... **KØGAS.** No one can hear me on SSB ... **K1EP.** It was a real kick when EA9IE called me for a new DXCC counter on 160. KL7J also called but I could not pull him out ... **K5RX.**

Good conditions in the Midwest, but not much Europe and no Pacific. Enjoyed my voice keyer ... **K9FO.** Only one Beverage and it gets line noise. Back next year with

Max, KH6ZM, operated from CW multi-op station KH6GP in Hawaii. (Photo by KH6B)

TOP 10 SCORES

SINGLE OPERATOR

USA CW		USA SSB	
W8JI	753,867	WB9Z	351,916
AA1K	622,440	W4MYA	333,036
W4MYA	554,400	W3GH	241,632
W4ZV	551,538	K5RX	236,124
N4PN	430,128	ND8DX	216,999
N2NT	414,960	N4PN	214,808
K4ZW	405,432	W3BGN	209,856
KD4D	404,328	NØFW	196,710
NO2R	383,968	N3HBX	193,725
K4JA	379,268	W3TS	161,226

VE (TOP 5)

CW		SSB	
VE3EJ	525,868	VY2ZM	890,370
VE3AT	404,432	VA3KA	407,744
VE3DZ	402,876	VE3PN	236,850
VE3QAA	253,125	VA3MO	205,854
VE3PN	212,949	VA5DX	204,930

QRP (TOP 5)

CW		SSB	
OM7DX	164,136	VE3MGY	63,945
YU1RA	130,845	UR4MBI	32,727
K8MFO	110,186	WA4JA	30,250
OK1FKD	95,150	UA3LBL	29,304
DF3KV	94,335	NP4VO	24,432

DX CW		DX SSB	
EA8BH	1,936,746	CN2R	1,028,508
D4B	1,293,732	D4B	904,812
PJ2S	1,099,122	LY4A	550,314
A61AJ	978,439	P40W	548,454
SN7Q	852,452	V47KP	391,206
SO2R	811,832	OK1RI	351,272
OK1RF	779,520	DJ4PT	326,655
YU1EXY	777,920	SY8A	314,175
HA8DU	754,844	KP4KE	311,505
S50A	708,864	ON4WW	309,048

LOW POWER (TOP 5)

D4B	1,293,732	KP4KE	311,505
G4RCG/HI9	452,720	NØFW	196,710
C6AYB	415,800	HI3TEJ	134,550
OK1CF	266,070	K1PX	133,196
DL1YD	244,013	UT3SA	115,805

W/VE LOW POWER TOP 3

K1PX	189,125	NØFW	163,370
K1HTV	180,937		

MULTI-OPERATOR

CW (WW)		SSB (WW)	
VP5/VE3NE	1,037,790	VP5B	678,855
9A5Y	1,033,818	UU7J	548,152
MD4K	1,010,004	XE1RCS	527,616
9A1A	1,008,546	DL6LBL	466,970
HG3DX	935.532	4LØG	443,712
I5JVA	928,116	T77C	442,716
OM7M	916,864	EI7M	423,808
OM8A	916,695	VE3DC	281,123
UU7J	898,876	N2CW	260,736
LX5A	874,956	HG1S	260,390

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4 or 5 Beverages ... **K9SG.** 160 SSB QRP is a lot of fun but one heckheva challenge ... **KR1ST.** Running at the high end of the band paid off. I had quite a pileup on 1960 kHz ... **KS7T** (Montana—ed). Only operated 10 minutes at the end but handed out some points ... **N1XS.** The contest team was comprised of ten first-time contesters and three experienced operators. We all had a great time ... **N2CW.** Still not much DX. One jammer would play back CQs and QSOs over and over ... **N3HBX.** Good conditions. Wish I had gone to my Florida Island QTH to operate. Only have an inverted-V high in a pine tree here in Georgia ... **N4PN.** Stations were solid from 1830 to 1955 kHz ... **N4UH.** Band was great but not as good as the CW weekend ... **N4XMX.** Limited effort as still recovering from my FS5UQ trip ... **N8II.** Suffering from laryngitis really slowed me down ... **NX9T.** Several stations had a hard time with the call. VE2 is Quebec not Ontario ... **VE2FAB.** Operated a few pleasant hours ... **VE3BNO.** Propagation was mostly north/ south. However, we did work a few Europeans ... **VE3DC.** New QTH and antennas seems to be playing much better than expected ... **VE3MGY.** SSB is an adventure ... **VY2ZM.** Very good conditions as the band was packed ... **W1CTN.** Should have looked above 1.9 MHz before Saturday night ... **W7NNN.**

SSB QRM DX

My first time in the 160 contest ... **CU3AN.** I just called S9 or S9+ stations when their frequency was clear ... **DJ3GE/QRP.** My first contest from EI as I am from Poland (ex-SP9JZT) ... **EI9JN.** My best result yet with 20 watts and long wire ... **ES5RIM.** Hard work on SSB with low power but be back next time ... **RX3QDF.** SM5Z is my contest call ... **SM5BPJ.** My first contest and it was fun ... **SV1GRD.** My first QRP effort ... **UR4MBI.** First time contesting from the Bahamas ... **C6AWB.** Great conditions to North America the first night ... **CN2R.** Had a lot of problems during the contest and was not able to operate the entire time. Congratulations to Jim, CN2R ... **D4B (op. 4L5A).** 25 watts to an end fed wire only 6 meters up ... **DF2LH.** Need to get more country multipliers next year ... **EI7M.** Could only operate one night. Still dreaming of a two night score ... **FM5GU.** The high point was the opening to Central America and the low point was not being able to spend more time on the band ... **G3VAO.** Was only planning to be QRV a few minutes. Came back at 2300 Saturday and stayed until 0700 Sunday ... **GW4BLE.** Used two dipoles this year ... **HB9CXZ.** There seems to be a lot of fine operators on the band ... **LA7AK.** Had two minutes to spare so switched on the rig in time to work RW2F for a new one ... **LB1LF.** First try on 160 SSB. Could only use 10 watts ... **M3RCV.** Happy to give a few points to BCC (as if they needed them--Hi) ... **OE2VEL.** You know you are wanted when the QSO rate meter hits over 300 Q/hour ... **OE5OHO.** Switching callsigns helps keep up a good rate and the operator motivated ... **OE5XVL.** Absolutely no propagation to the USA ... **OHØNL (op. OH2BYS).** Better conditions than I expected ... **OK1RI.** My first 160 contest. I need Beverages ... **OZ1ADL.** A nice contest with a lot of stations. Just would like to work some North America ... **PAØIJM.** Had to go to the hospital. Back next year ... **PA4GCV.** WB9Z was the only USA worked this year ... **PY3CEJ.** I am Asiatic Russia not Ukraine ... **RL9F.** My best 160 meter score ever ... **S57DX.** Increased the height of our inverted-L over a salt water lagoon ... **V31MD.** Good opening to Europe on Saturday ... **XE1RCS.**

(Continued on page 104)

CLUB SCORES

(Minimum of 3 three entries required for listing)

CLUB	SCORE
BAVARIAN CONTEST CLUB	12.527,339
POTOMAC VALLEY RADIO CLUB	8,362,639
FRANKFORD RADIO CLUB	7,576,579
SLOVENIAN CONTEST CLUB	5,050,412
CONTEST CLUB ONTARIO	4,667,163
YANKEE CLIPPER CONTEST CLUB	4,664,530
RHEIN RHUR DX ASSOCIATION	4,141,991
CONTEST CLUB FINLAND	3,816,010
HA DX CLUB	3,309,940
SOC OF MIDWEST CONTESTERS	3,054,397
ATCC (REP OF GEORGIA)	2,616,298
SOUTHEAST CONTEST CLUB	2,520,567
SP DX CLUB	2,466,924
CHILTERN DX CLUB (UK)	2,462,716
TENNESSEE CONTEST GROUP	2,229,967
KTU RADIO CLUB (LITHUANIA)	1,913,338
PORDENONE GANGSTERS	1,798,381
URAL CONTEST GROUP	1,623,649
FLORIDA CONTEST GROUP	1,612,926
NORTH TEXAS CONTEST CLUB	1,486,052
BANAT DX GROUP	1,482536
MAD RIVER RADIO CLUB	1,398,089
CROATIAN CONTEST CLUB	1,159,855
RUSSIAN CONTEST CLUB	1,073,943
KANSAS CITY DX CLUB	1,027,548
NORTHERN CALIFORNIA CONTEST CLUB	968,520
YO DX CLUB	938,305
BELARUS CONTEST CLUB	842,324
UKRAIANIAN CONTEST CLUB	838,574
UA2 CONTEST CLUB	804,260
CENTRAL TEXAS CONTEST/DX CLUB	780,726
UFT (FRANCE)	757,577
CONTEST CLUB KRASNODARSKOGO (KKKK)	713,405
WORLD WIDE YOUNG CONTESTERS	680,558
VRHNIKA CONTESTERS (SLOVENIA)	659,907
CENTRAL ARIZONA DX ASSO	612,852
MINNESOTA WIRELESS ASSO	545,198
TIKIRRIKI CONTEST CLUB (ITALY)	515,451
LYNX DX GROUP (SPAIN)	502,436
DARC (GERMANY)	485,612
SCOTISH-RUSSIAN ARS	477,327
GRAND MESA CONTESTERS	469,283
CACTUS RADIO CLUB	455,776
SW OHIO DX ASSOCIATION	434,324
URE (SPAIN)	369,546
HUDSON VALLEY CONTEST DX CLUB	361,793
SPOKANE DX ASSOCIATION	343,787
OKLAHOMA DX ASSOCIATION	343,727
SOUTHERN CALIF CONTEST CLUB	330,368
LATVIAN CONTEST CLUB	280,967
BR. COLUMBIA DX CLUB	271,745
MEDINA 2 METER GROUP	270,999
CT/RI CONTEST GROUP	270,896
CAROLINA DX ASSOCIATION	262,966
KIEV CONTEST GROUP	255,405
SOUTHEASTERN DX CLUB	218,838
KENTUCKY CONTEST GROUP	204,576
TEXAS DX SOCIETY	193,130
NO ARIZONA DX ASSOCIATION	169,451
CENTRAL SIBERIA DX CLUB	154,851
GREEN VALLEY ARS	146,633
FOX CONTEST CLUB (SERBIA)	145,173
MOSCOW CONTEST CLUB	121,066
VERON (NETHERLANDS)	115,610
VLADIMIR RADIO CLUB	92,759
WESTERN WASHINGTON DX CLUB	89,317
WEST PARK RADIO OPERATORS	68,440
RADIO AMATOR (UKRAINE)	54,177
BERGEN AMATEUR RADIO ASSOCIATION	23,120

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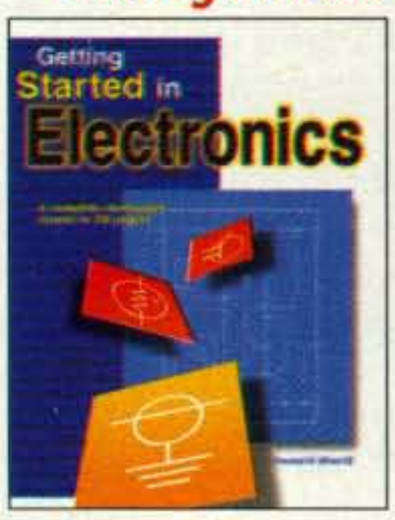

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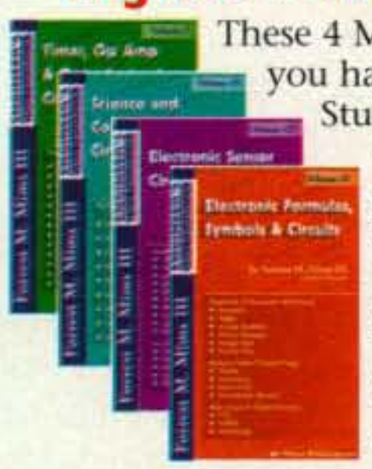

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math's notes

BY IRWIN MATH,* WA2NDM

Those "Wall Warts"

If you are at all like me, you probably have a whole bunch of so-called "wall warts" lying in a corner of the shack. They have many uses (in addition to ballast) that you may not be aware of, so if you do have a "bunch" (or even one or two from some discarded appliance), don't throw them out, and read on.

A typical wall wart (I hate that term, by the way, and prefer to call them plug-in power supplies, since that is what they really are) is nothing more than a 115-VAC (230 VAC for those of you outside the U.S.) step-down transformer that produces some lower voltage connected to one of three internal output circuits as shown in fig. 1. The first provides a simple AC output, the second contains a half-wave rectifier with a filter capacitor, and the third, a full-wave rectifier (or sometimes a bridge) and a filter capacitor. The last two produce an unregulated DC output. The more sophisticated units may even have a three-terminal voltage regulator included, although this is not generally the case. As a result, these devices really should be thought of as complete, ready-made power supplies that are ideal for powering a multitude of home-brew projects, are AC line isolated (and safe), and in many cases are even approved by UL as well as various foreign regulatory agencies. They also come with various connectors and/or terminal blocks.

To begin with, we measured some of the plug-in power supplies in our collection and came up with a chart of some interesting representative data, as indicated in Table I. As you can see, voltages from 3.5 to 24 volts are available and current ranges of up to an ampere are common. Keep in mind that the chart is only representative of what we found in our junk box. There are countless variations with all sorts of specifications.

As we mentioned, most of these plug-in power supplies come with connectors attached and even

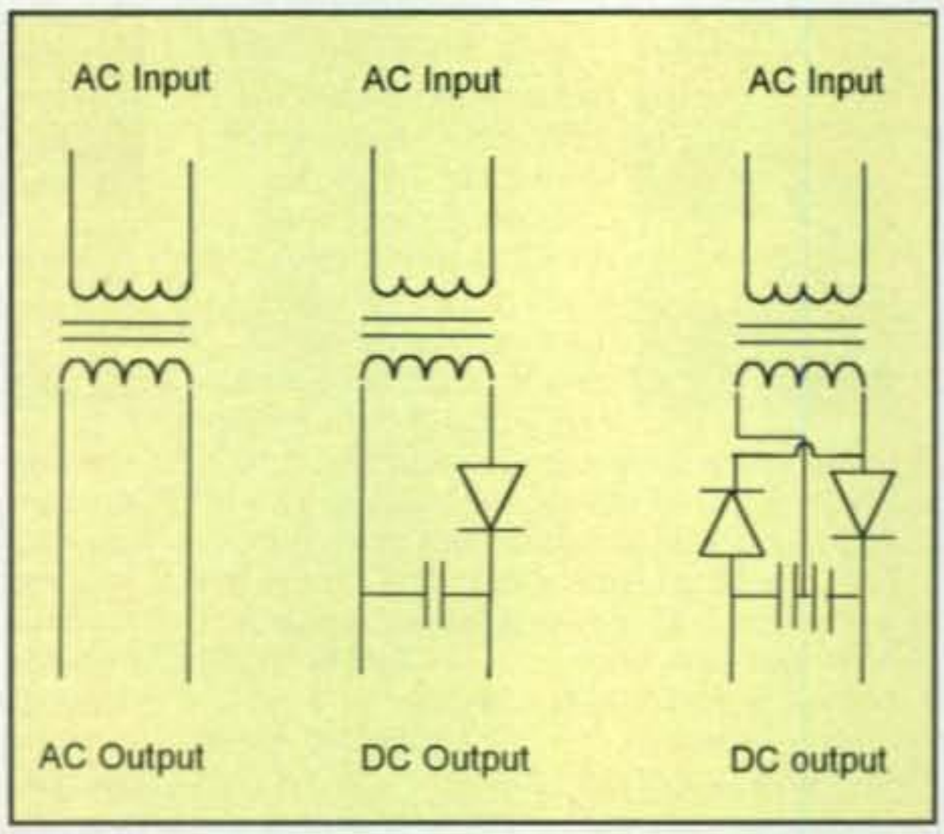

Fig. 1– Typical wall-wart internal circuitry.

molded onto the output leads. These range from coaxial plugs to Molex-type connectors, and in some cases even actual terminal blocks. Whether or not you use them depends on the application. Mouser Electronics has a range of mating receptacles manufactured by Kycon and Kobiconn, and other distributors also supply similar connectors. If you do plan to use mating connectors, be sure to get the correct size. At first glance they all may look the same, but the barrels and openings vary, so check carefully. As an alternative, you can simply cut off the plug, strip the wires, and solder them directly into your circuit.

Using a plug-in power supply is quite easy. If unregulated voltages are needed, simply connect the unit as is. If a regulated output is needed, add the appropriate 7800-series three-terminal regulator to a DC unit as shown in fig. 2. Be sure that the full load voltage at the input to the regulator is at least 2 volts higher than the output voltage you need to be sure of proper operation of the regulator. This

*c/o CQ magazine

Rated Voltage	Rated Current (milliamperes)	Open-Circuit Voltage
3.6	250	6.0 (DC)
4.5	400	5.8 (DC)
9	350	11.2 (DC)
9	500	11.8 (DC)
9	500	13.8 (AC)
9	750	13.0 (DC)
12	300	16.2 (DC)
12	1000	17.3 (DC)
16	750	18.1 (AC)
24	1000	28.2 (DC)

Table I- Some plug-in power supplies and their specifications.

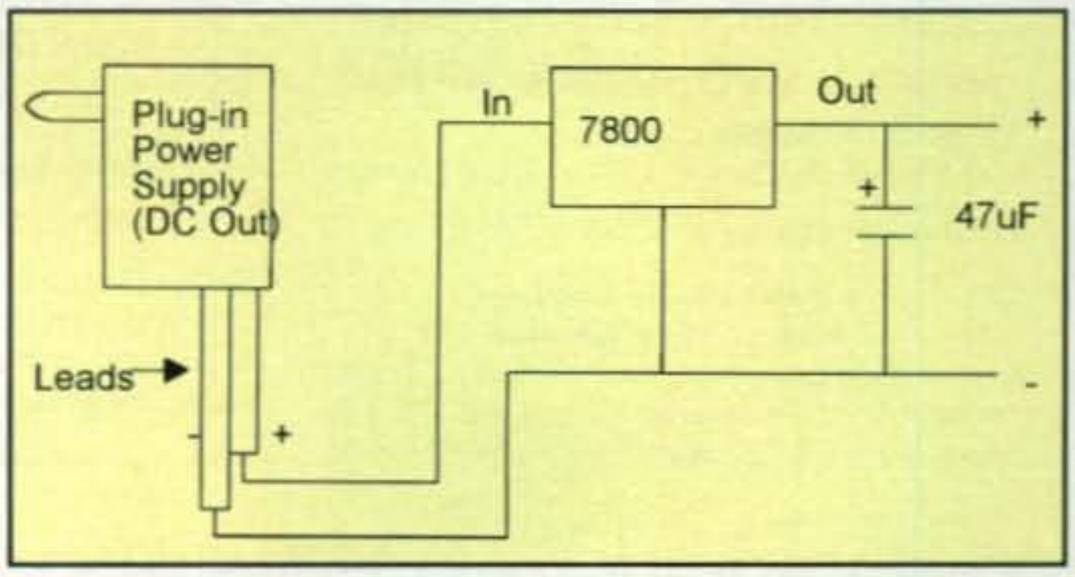

Fig. 2– Regulated power-supply configuration.

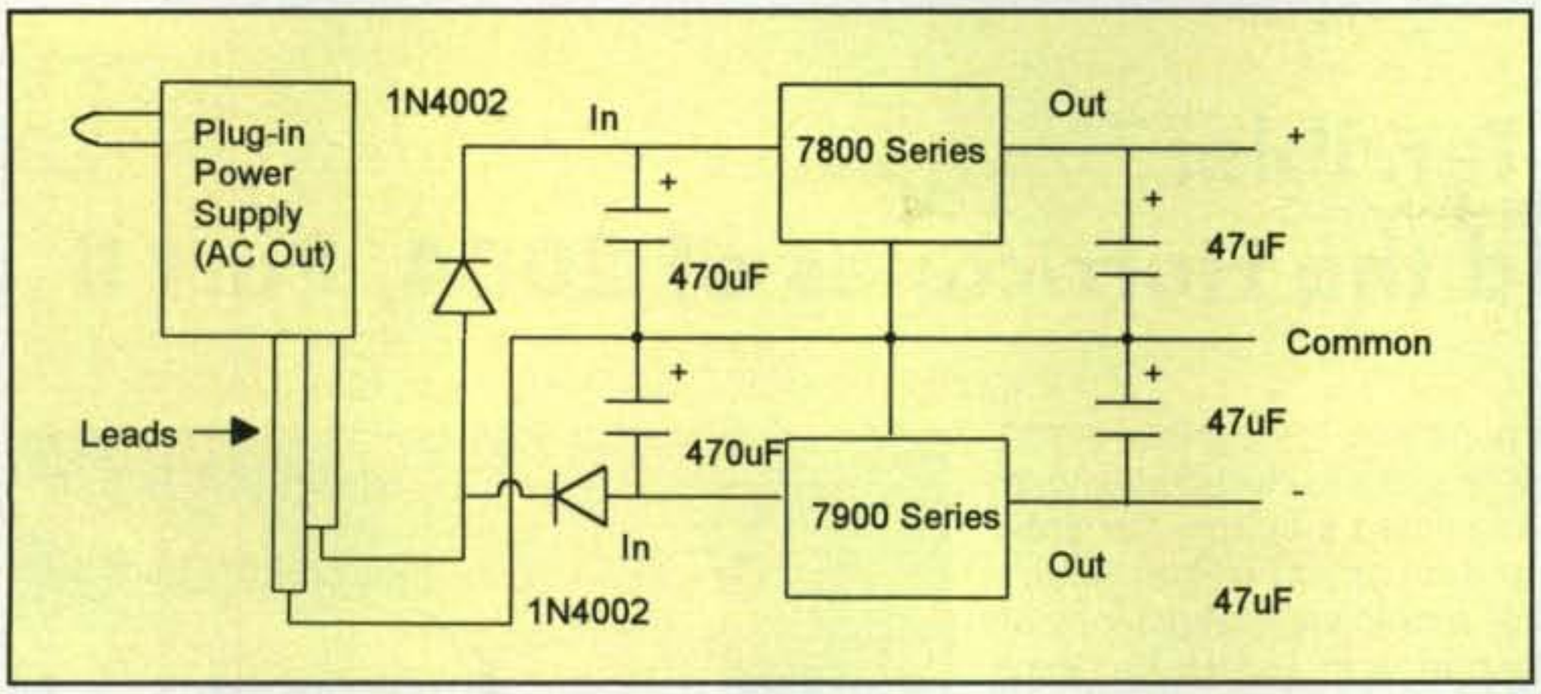

Fig. 3– Regulated dual-output power-supply configuration.

means that for a 5-volt DC (output) supply, your plug-in power supply should provide at least 7 volts (under full load) at the regulator's input. Also be sure to get the polarity correct. The positive lead from the wall unit is often identified by a white stripe, but use your DVM (digital volt meter) to be certain. If you need a ± supply, use the circuit of fig. 3 with a plug-in unit that provides an AC output.

Whatever configuration you need, the wall-type plug-in power supply is a very economical approach for many applications, especially since these devices are often "left over" from defective appliances and are usually available for the asking.

I sincerely hope all of you have a happy and healthy holiday season. I also want to thank you for your continued comments, letters, and general support over the 30-plus years of "Math's Notes." I hope I can continue to instruct, help, stimulate, and otherwise entertain you for many more years to come!

73, Irwin, WA2NDM

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BY BOB JOSUWEIT,* WA3PZO

Ivan the Terrible: Hams and the Hurricanes of 2004, Part II

As if eight tropical storms in August weren't enough, two more storms, Hurricanes Ivan and Jeanne, unleashed their fury throughout the Caribbean and the eastern United States during September. This month we'll take a look at the amateur radio response to Hurricane Ivan, much of which was repeated as Hurricane Jeanne swept into south Florida at practically the same point at which Hurricane Frances had come ashore just a few weeks earlier.

"August was Only a Drill"

That's how one ham described it in a message posted on the Internet. In what seemed to be a never-ending story, volunteers at the National Hurricane Center's amateur radio station, WX4NHC, members of the Hurricane Watch Net,

Alex Carver, KF4LVZ, monitors hurricane activity from the Georgia Tech Amateur Radio Club, W4AQL. (Courtesy of KF4LVZ)

*c/o CQ magazine
e-mail: <wa3pzo@cq-amateur-radio.com>

Guidelines for Disaster Service

Hams traveling into the area were given the following guidelines:

• Length of deployment: Plan for four days (at your option longer); adjust your "kit" as necessary.

• Fuel: If you are driving, keep your tank topped off, and carry at least five gallons of extra fuel with you (observing the common safety issues with any combustible mixture). It may be some distance to a station.

• Expenditures: Persons volunteering for deployment should keep all receipts pertaining to their deployment plus total mileage for the duration for possible reimbursement by the state.

What you will need to bring:

• Radios: A good working 2-meter radio with a portable antenna is necessary (something to hang up the antenna, such as string or fishing line, is recommended).

• A 2-meter handheld is a good idea, but bring a 12-volt power source for charging batteries, extra batteries, and AC charger as needed.

• An HF radio with some type of tuner may not be necessary but is a good option. Remember to bring an antenna that can be supported between tree branches (such as a long wire, dipole, or end-fed Zepp antenna), as well as plenty of coax to reach your radio (100 ft. or more is a good figure).

Personal items:

• Sleeping: Some type of bedroll for personal comfort (air mattress, sleeping bag) and a pillow. You may be sleeping on a floor or in the back of a truck. Plan for unknown conditions.

• Eating: Plan on packing personal food for four to five days (breakfast, lunch, dinner, snacks) and eating utensils, portable stove(grill), and cooking utensils. There are some food wagons on the way, and some may be in the area, but many people are still eating MREs (Meals Ready to Eat). Take as much water with you as possible; five to eight gallons is recommended. There is a boil-water statement in effect for all counties impacted.

Toiletries:

• Soap
• Towels (How many do you use in four days?)
• Washcloth
• Shaving equipment
• Toothbrush and toothpaste
• Plastic trash bags for dirty laundry, trash, water proofing your dry goods, etc.
• A small bottle of Clorox for treating non-potable water for bathing (10 drops per gallon) is a good idea.
• Toilet paper (two or more rolls)
• Anything else I might have forgotten in this category

Medical and health related:

• Pack at least seven days worth of any pills that you may be taking, in a sealable type bag to keep them dry.
• A basic medical kit is a good idea. Many hospitals are down and the DMAT (Disaster Medical Assistance Team) groups are not completely located to service all areas.
• Lots of good mosquito repellent. Most with DEET are a good choice. Citronella candles are optional.

Clothing:

• Clothing for four to five days (pants, shoes, socks, shirts, underwear, etc.)
• Rain coat or poncho
• A warm jacket may not be needed, but you can always bring it back with you if you don't use it.

Be self-contained in all aspects, including personal toilet needs.

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Models available for all transceivers with 8-pin round, 8-pin modular (RJ-45) or 4-pin round microphone plugs.

Operate PSK-31, packet, APRS, AMTOR, RTTY, SSTV, CW, high speed CW Meteor Scatter and many others. Also use as Contest Voice Keyer and CW Contest Memory Keyer.

Digital Modes or Normal Operation

Select the ON digital mode -- all connections are made between your rig and computer for instant digital operation.

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Audio isolation transformers and relay eliminate ground loops, audio hum, noise and distortion.

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Transmit mic audio at any time by pressing PTT to override digital modes -- great for SSTV and Contest Voice Keyer.

More Impressive Features

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Stereo or Mono Audio Input -- A front panel switch selects left, right, or both sound card audio output channels to accommodate various programs.

Off-the-air recording -- for replaying or for use with spectrum analyzer programs.

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From Southeast to Northwest: Wind and Rain to Smoke and Ash

While Florida amateur radio operators were standing down from weeks of providing emergency communications, amateur radio operators in the northwestern United States began paying attention to activity on Mt. St. Helens in eastern Washington State. In the beginning of October a volcanic eruption was predicted, and for several days large plumes of steam and some ash escaped from the mountain.

As this issue's deadline approached, scientists warned that the "escalation of unrest could occur suddenly and perhaps lead to an eruption with very little warning. There may be little time to raise the alert level before a hazardous event occurs."

Scientists have said that they do not expect that any new eruption of Mt. St. Helens would be as big as the May 1980 eruption that killed 57 people. However, they were still concerned about steam plumes reaching 10 to 15 miles into the air.

Monitoring activity on Mt. St. Helens no longer requires observers to be close to the volcano, thanks to scientific advancements in wireless measuring techniques. This was not the case during the 1980 eruption...

A Look Back

In the early spring of 1980 there were indications that the long-dormant volcano was becoming active. Members of the Amateur Radio Emergency Service (ARES) and the Radio Amateur Civil Emergency Service (RACES) began to monitor and report tremor activity and observations to Washington State officials as well as operate photography equipment set up by the National Geographic Society.

These hams were several miles from the volcano. On May 18, Reade Apgar, N7AGG, reviewed the location of the ham observers with state officials. From what they knew, all observers were in safe positions. Then at 8:32 AM, Gerald Martin, W6TQF, reported the first word of the blast from his observation post, just below the top of what is now called Johnston Ridge, some 10 miles away from the volcano. Martin could see what was about to happen and continued to report that the blast had gotten the two men camped below him and that he was going to be next. The blast had blown off the top 1300 feet of the mountain and had sent volcanic ash up to 60,000 feet into the air. Martin's eyewitness account of the eruption can be heard at the Mount St. Helens Visitor Center.

Reid Blackburn, KA7AMF, who was a few miles closer to the volcano, was not heard that morning. Later in the day an emergency rescue helicopter got to his site. The crew found several feet of hot volcanic ash. Reid's car was burning. His body was recovered three days later. Both Martin and Blackburn are honored on a monument at ARRL Headquarters which commemorates amateur operators who sacrificed their lives while performing amateur radio emergency communications and public-service duties.

A plume of steam rises above the crater of Mount St. Helens in Washington State on October 1, 2004. Two ham observers were among 57 people killed when the volcano experienced a massive eruption in 1980. (USGS photograph by John Pallister)

Reid Blackburn, KA7AMF's car about 10 miles from Mt. St. Helens following the May 18, 1980 eruption. Blackburn died in the eruption. (USGS Photo by Danial Dzurisn)

and others activated again as Hurricane Ivan made its way towards the Cayman Islands and Jamaica. For 15 hours a day the Hurricane Center gathered reports from a cadre of reporting stations on 20 meters as well as VHF/UHF stations participating in the VoIP Hurricane Net. The VoIP Net is a combination of repeater systems using either IRLP or Echolink software to link themselves together over the Internet (for more on VoIP, see this month's "Digital" column).

Preparations Begin

The reports were ominous. The Cayman Islands and Jamaica were in the path of an extremely dangerous Category 5 hurricane that had maximum sustained winds of 160 mph. The National Hurricane Center warned, "Ivan could still intensify a little more."

VoIP Net Control Station Rob Macedo, KD1CY, said, "We are trying to coordinate with the IRLP node owners on the Cayman Islands and Jamaica on usage of their nodes and liaisons to those affected areas. It's not clear whether we will have liaisons to the islands like we did with the Leeward Islands ... but we're working hard to assure that it occurs. If it does not occur, it is wise for us to have the net up in case someone connects in via Echolink and (relays) reports off of their local VHF frequencies. There are no Echolink/IRLP nodes in Cuba."

Volunteers Around the Country Stand By and Listen

As Ivan made its way through the Caribbean, volunteers from Georgia to the Washington stood by and monitored in case their assistance was needed. National Hurricane Center advisories indicated that the path of Hurricane Ivan was not clear after it passed over Cuba. Residents in the affected areas were warned by forecasters to monitor the situation closely, as there was a possibility that the hurricane's forward progress would slow and emergency

nets would be activated for an extended period of time.

Alex Carver, KF4LVZ, Vice President of the Georgia Tech Amateur Radio Club, W4AQL, said amateur radio volunteers in the path of Hurricane Ivan stayed by their radios to transmit the crucial weather data that the National Hurricane Center needed for its forecasts. He described one operator in the Caribbean who was "transmitting his information the best he could," but then, "his transmission just broke off—completely, suddenly, mid-transmission, we lost it."

Carver said the Hurricane Net depended on volunteer radio operators across the United States because band conditions sometimes made it difficult for the National Hurricane Center to hear the reports. He credited people in the storm's path for collecting as much data as possible and then providing rescue information after the hurricane passed. Reports from Grand Cayman Island indicated that people were standing on the roofs of their homes because of storm surges of up to 8 feet above normal tide levels. Roofs were ripped off homes on Tobago, St. Vincent, and Grenada.

Ivan Turns Its Sights To the Gulf Coast

After battering the Caribbean, Hurricane Ivan headed for the Gulf of Mexico. It was clear that Florida was about to be hit again, with evacuations ordered as far west at New Orleans. This time Florida's west coast was spared the worst of the storm, which moved across the Florida panhandle and coastal Alabama and then moved north. Ivan was devastating as it moved through the southern United States and worked its way to North Carolina, Maryland, Pennsylvania, and New Jersey, dumping flooding rains in its path. (One of the strangest aspects of this storm was that even after the center of circulation had moved north, some of its remnants regenerated themselves and moved across the Gulf to Texas!)

A Call for Help

After Ivan roared through the Florida panhandle, ARRL Northern Florida Section Traffic Manager Dale Sewell, N4SGQ, issued a call for help. He said:

"Currently the need is for 46 (hams) total. There are less than 10 traveling in so far, so consider the 46 request open, as there are locals cycling out fast from fatigue. I anticipate additional requests shortly. Filling the 46 request is the pri-

TECH TALK

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IC-910H

But it is single sideband on VHF and UHF that may offer instant excitement! Try 50.125, upper sideband, and maybe catch some 1,500-mile skywave "skip" in the early morning and early evening hours. Once you make contact, move up the band to around 50.150 to clear the calling channel.

On 2-Meters, you'll find single-sideband, long-range nets around 144.180 through 144.250 MHz. 144.200 MHz, upper sideband, is the call and shift-up frequency. Antenna polarization is normally horizontal, but some sideband nets switch to vertical every few minutes so no one gets left out. Tropospheric ducting could lead to contacts up to 300 miles away!

432.100 MHz upper sideband is where you'll find weak signal calling. Many nets are also found on this frequency; and while horizontal polarization of your antenna is recommended, you should still be able to hear some pretty good DX with a mobile or base vertical.

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This image shows the APRS beacon of David Lane, K4ZZR, who managed to keep his station on the air as Hurricane Jeanne made a direct hit on his QTH. (Photo from findu.com)

mary concern at this point. We had a good response for a weekend turnout, but the week is going to be tough. Any help you can give us on that will be appreciated. The plan is a familiar scenario. Self sufficient, no power, lodging, 8 AM to 7 PM curfew in Escambia, no fuel in affected area, repeaters up in both counties, water and food available Red Cross style but bring what you can, no sanitary facilities guaranteed, and a need to work with the ability to make decisions in a difficult environment."

Sewell continued, "The travel routes going in are detours and are slow going, full of National Guard who are helpful. The post traumatic stress issues are a factor. Tempers are getting short from fatigue and heat. These folks really need help and everyone out there knows what that's like."

An additional call went out for jump teams to help the individuals of Escambia and Santa Rosa Counties in the panhandle of Florida. The message came from the Northern Florida Amateur Radio Emergency Service leadership:

"As you may have seen on TV or heard on the radio, most of the people in those northern coastal areas are without power, potable water, phone service, cell-phone service, and television stations and AM radio are off the air, some FM stations operable if you have battery-operated receivers. Many hospitals are non-operational, and many residents in all counties impacted have lost their homes. Still more will not be allowed to return to their homes because the foundations of these homes are unstable and are considered condemned and will be razed.

"There is an immediate need for 30 operators in Escambia County, the Pensacola area, and 16 operators in Santa Rosa County (as in be there by Monday or Tuesday). Additionally, these operators will need to be replenished or relieved every three to four days by other volunteers ... I know that we have served where needed locally through three hurricane events. Many of us are still cleaning up our own properties and restoring our lives, but our services are sincerely needed to assist those in most dire need of everything that sustains life, and the means to acquire these necessities is in the sole hands of radio operators like you and me ... If you can help, we need your skills."

Volunteer Considerations

When traveling into a disaster area, there is a need to be self-sufficient. Potential volunteers were told that "due to the elevated temperatures and humidity from ground water, any ham with heart problems or breathing difficulties (asthma, etc.) is requested not to volunteer for the trip."

Sewell coordinated the deployment of hams to the disaster area by issuing maps, directions, and tracking numbers. See the list of guidelines issued for serving in the Florida panhandle.

That request for additional operators continued until September 21, when it was determined that amateur radio communications could secure within a few days. Sewell thanked all "who have helped in this critical operation."

Ivan Moves North

North Carolina Emergency Management officials requested the assistance of amateur radio operators along the Virginia and Tennessee borders. The National Weather Service activated Skywarn members in the greater Charlotte area for flooding and tornadoes. Amateur radio continued to be pressed into service as heavy rains triggered flooding across Pennsylvania and parts of New Jersey.

When Normal Communications Failed

For two months amateur radio operators across Florida and other areas held communications together. From telephone systems being destroyed, to electricity not being supplied to cell telephone systems, to county public-safety frequencies being overloaded or damaged by storms, hams filled in the gaps. Palm Beach County, Florida emergency workers relied on unreliable backup power. They had to use a combination of ham radio communication, computers, and cell phones to dispatch firefighters and paramedics.

In Highland County, Florida amateur radio operators served 24-hour shifts during Hurricane Charley only to be on duty for 12 hour shifts for six days during the cleanup. Just five days later these same hams were pressed into service for a 36–48 hour shift as Hurricane Frances made its way through central Florida.

The response to this year's hurricane season has really been an international effort. It showed that amateur radio operators really are professionals at what they do. Some scientists predict that we will see even stronger hurricanes in the future. Will *you* be ready to respond?

With Thanks...

Being able to bring you the stories of ham radio operators serving in the public interest is a real honor. Many times it couldn't be done without your help and input. With hopes that everyone can get a much needed rest this month, we'll wish all of you the best of the Holiday Season and best wishes for 2005. Until next time . . .

73, Bob, WA3PZO

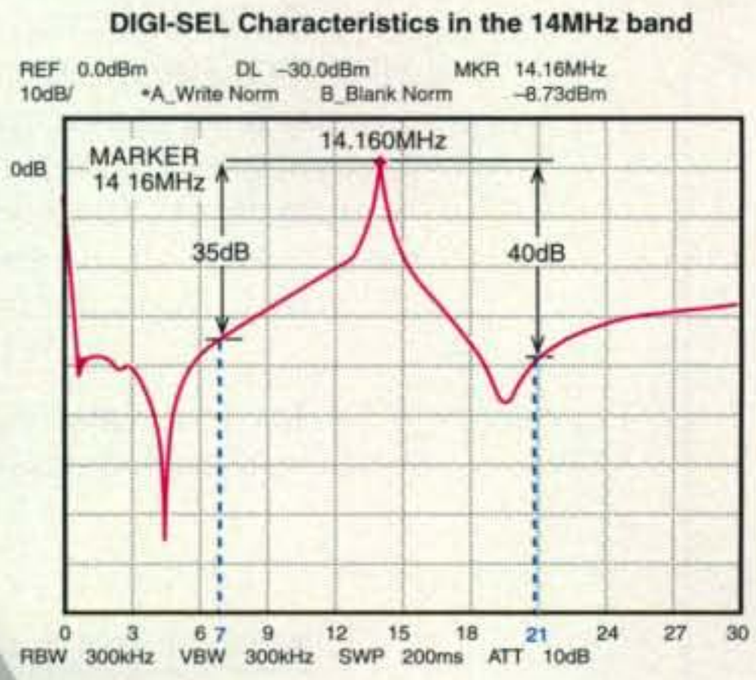
TECH TALK

IC-7800 Digi-Sel: State-of-the-art preselector

Top-band enthusiasts and multi-multi contest station operators place incredible demands on their receivers. On 160 meters, amateurs who live in urban areas often have one or more local 50-kilowatt AM broadcast transmitters operating just below 1.8MHz. On any band, multi-multi contest stations may have as many as six full-legal-limit transmitters operating simultaneously, with antennas located very close to each other. If undesired out-of-band signals saturate the first mixer stage, the receiver will be useless for weak-signal DXing or contesting. Even a receiver with a +40dBm Third Order Intercept (TOI) can be overloaded under these extreme conditions!

External bandpass and band-reject filters are one way to battle strong out-of-band signals. Another device that's very useful for out-of-band signal rejection is a receiver preselector. Several popular radios of the 1970s had receiver preselectors that worked very well, but required manual adjustment whenever you changed frequency by more than a few dozen kHz. Although they improved receiver performance when adjusted correctly, they could seriously degrade receiver performance if you changed frequency and forgot to "tweak" the preselector control.

The ideal preselector adds selectivity to the receiver front end while automatically tracking the tuning control. Enter the IC-7800 Digi-Sel tracking preselector! The IC-7800's microcontroller tunes the Digi-Sel preselector automatically so that its response peak is always centered on your operating frequency. The following diagram shows the actual measured response of the Digi-Sel tracking preselector when the IC-7800 is receiving in the 20 meter SSB band (14.160MHz). Notice that the preselector suppresses signals on 40 meters (7MHz) by 35dB and signals on 15 meters (21MHz) by 40dB!



The IC-7800 tunes the Digi-Sel preselector by adding and subtracting inductance and capacitance from a tuned circuit. Icom's engineers designed the preselector for absolute maximum immunity from strong-signal overload and for absolute minimum distortion by using state-of-the-art ultra-miniature relays instead of switching diodes. A preselector that uses switching diodes can introduce in-band spurious signals in the presence of very strong out-of-band signals — a preselector that uses relays and passive components (inductors and capacitors) cannot.

How could we make Digi-Sel even more useful? By including one in each of the front ends of both receivers in the IC-7800! Imagine using dual-watch on the same or different bands with two identical, independent receivers, both of which have a tracking preselector in the front end!

Better yet, don't imagine it — try it for yourself! Test-drive the new IC-7800 at your favorite authorized ICOM dealer.

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digital connection

BY DON ROTOLO,* N2IRZ

Ham Radio and VoIP

Is it still amateur radio without the radio? Maybe, maybe not. On one hand, the communication is the key, regardless of medium. On the other hand, *radio* is at least half the equation, and the name. If we were to lose access to the "radio" part, how many of us would still be involved?

With that in mind, this month we will delve into the world of Voice over Internet Protocol, or VoIP, as used today in amateur radio. Some folks proclaim Internet linking as a death knell for amateur radio. I disagree. The same predictions of doom came about when people started linking packet nodes over wirelines (the Internet was not yet really a factor), but today we have a stronger VHF packet system, providing "last mile" data connections instead of trying to cover immense distances. In other words, we're making the best use of the technology.

So it will go with VoIP and other synergies between radio and wires. It doesn't make much sense to use (relatively) unreliable radio links for a job the Internet can do a zillion times better. It will not cause us to lose spectrum, or reduce the popularity of radio; instead, *more* will use it because it works so well. Do you think a major *radio* manufacturer (Yaesu) would develop a VoIP system (WIRES-II) if it thought it would make radio obsolete? Even if the Internet infrastructure is destroyed in an area due to a disaster, it is unlikely to disappear worldwide, and so radio will still serve best as the "last mile" (or last hundred miles) for critical communications. (If the Internet *did* somehow go down worldwide, there would be larger issues afoot than amateur radio, of course, although amateurs would most likely still be able to communicate.)

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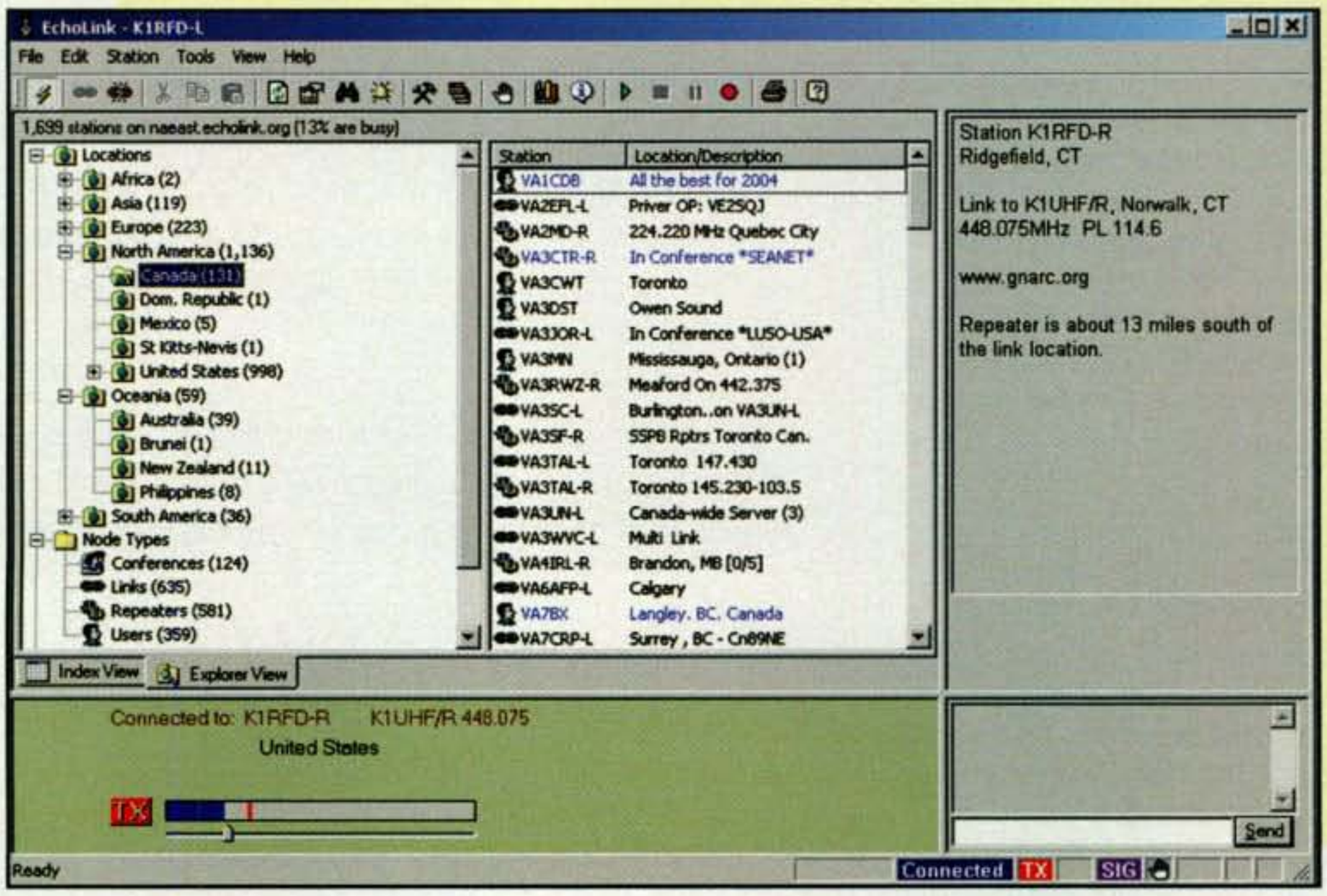
e-mail: <n2irz@cq-amateur-radio.com>

What Is It?

What exactly is VoIP and how does it work? I can only offer a very basic overview, as the topic would easily fill a textbook.

Voice over Internet Protocol is exactly that: Voice signals, as we often use for radio communications, being sent using the Internet protocol. Much like digital voice, we start by capturing a voice (or other sound) signal and "digitizing" it, turning the analog audio stream into a digital bit stream. How exactly we capture it, how many bits are needed to represent a particular sound, and just how faithful the reproduced sound will be to the original all are technical details. Hardware, software, and configuration settings control these finer points, but we do not have to even understand it in order to use it.

Virtually any computer with a sound card is able to record a voice signal and save it as a file. One could then e-mail that file to a friend, but that isn't really VoIP, since it is not being done in real time. The key to VoIP is not how you digitize the voice



A screen shot of an EchoLink QSO in progress, showing the K1RFD repeater linked to the K1UHF repeater. (Courtesy of K1RFD)

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signal, but how you transport the data to another computer and then reconstruct it back into sound, in real time.

Early VoIP was used as a replacement for telephone calls. Any two people who could connect to the Internet could carry on a half-duplex (limited by the sound card) telephone conversation for as long as they like, with no cost above their access to the Internet. Voice quality was often less than toll-quality, a technical compromise to limit data bandwidth in the days of 28.8k dial-up, while dropouts and disconnections were not uncommon.

The transport mechanism is a little more complex. The Internet works much like a packet-radio network, in that data is sent as little packets of data, rather than a continuous bit stream (like PSK31 or RTTY). In order for VoIP to work, you need to get all the packets to the other end of the connection, in the right order, and do it fast, as nobody wants a 5- or 10-second delay in a communications channel. Because it is voice, a few missed packets or moments of silence are okay, as is a delay of about a second.

Moving from telephone calls to repeater linking wasn't a huge leap, but that's not to say it was easy to do. Much of the basic work—audio digitizing and decoding, the Internet and transport mechanisms, computer sound cards—was already there, but putting it all together, in a way that prevents non-amateurs from accessing a transmitter, and making it easy to install and configure . . . now that took some serious thinking and work.

EchoLink

Some time ago (September 2000), I wrote about the W7DXX Remote Base, a radio transceiver controlled over the Internet. VoIP is yet another way to get "on the air" without a radio, although its real value is its ability to link up widely separated radios. Two popular VoIP systems for amateur radio are IRLP (Internet Radio Linking Project, by Dave Cameron, VE7LTD) and the newer EchoLink (by Jonathan Taylor, K1RFD). I'll focus on EchoLink, since I am more familiar with it, but that shouldn't make you think any less of IRLP or any of the other VoIP systems out there (such as eQSO and WIRES-II).

As an over-the-air EchoLink user, you don't need any special equipment, just your regular radio. When it is linked in, it seems as if your local station just has wider coverage, although the "rest" of the coverage could be half a world away. You send DTMF tones (Table I) to control the link. If you know the EchoLink Node Number (address) of the other station you'd like to link in, you just enter it, but there's a search feature to help, and even a random mode. Search results are read over the air to you by a quasi-synthesized voice. Tune to the node or repeater input frequency and, using DTMF tones, build the link and have fun!

EchoLink can be very helpful for emergency communications by voice, much as WinLink 2000 can be for e-mail. While local EchoLink stations might be out of commission from a failure of equipment, power, or the Internet, distant stations with HF EchoLink gateways would still be there, as would the Internet. Once you get into the EchoLink system, you can go wherever you need. For example, in December 2002 a powerful typhoon struck Guam. Links to the island via HF were unsuccessful, but a voice channel was successfully established via EchoLink.

Setting It Up

Of course, as a Local Radio User (maybe just driving around in your car), you can set up a link between your local station and some distant one, and all you need is a radio. If you run the EchoLink software on your computer, however, you are either a Sysop or User.

As a Sysop (System Operator), you are expected to connect a radio to your computer, providing infrastructure for others to use. The Sysop can connect either a simplex radio or a repeater, but either way this role requires some commitment and funding, as well as a fast link to the Internet (and in some areas frequency coordination).

Many of us will work with EchoLink in the User mode. For this, all you need is a Windows® computer with a sound

Are WinLink 2000 and PacTOR the Enemy?

Just a short note about the controversy over the supposed "requirement" that WinLink 2000 (recently recommended by the ARRL for ARES work) will only operate with PacTOR. Let me state it plainly: **There is no such requirement.** WinLink 2000 will work with *any* data mode that is error-free. This includes Packet, PacTOR, and many other modes, but not "non-error-free" modes such as PSK31. The introduction of any error into an e-mail header obviously is a bad thing.

With that in mind, there is nothing out there that beats PacTOR III in performance or spectrum efficiency, with PacTOR II not far behind. Many are rankled by the "closed source" nature of PacTOR, but you can't blame the inventors for wanting to protect their intellectual property. Others get upset when the PacTOR "robots" come up on frequency and blow away all the PSK31 QSOs, something I experience regularly. While it is rude and maybe violates Part 97, we all need to work together to find a home for these operations instead of banning them altogether.

WinLink 2000 and PacTOR are valuable tools we have, so let's address the specific issues they bring up cooperatively instead of blindly condemning the good with the bad.

Command	Description	Default
Connect	Connects to a station on the Internet, based on its node number.	<num>
Connect by Call	Connects to a station on the Internet, based on its callsign.	**C**+call+**#**
Random Node	Selects an available node (of any type) at random, and tries to connect to it.	**00**
RandomFavNode	Selects an available node (of any type) at random from the Favorites List, and tries to connect to it.	**001**
Disconnect	Disconnects the station that is currently connected. If more than one station is connected, disconnects only the most recently connected station.	#
Status	Announces the callsign of each station currently connected.	**08**
Play Info	Plays a brief ID message.	*
Query by Call	Looks up a station by its callsign, and reads back its node number and status.	**07**+call+**#**

Table I– Some common DTMF commands in EchoLink. (Reproduced with permission)

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It's perfect for Ameritron's most powerful amplifiers where the ATR-30 just loafs.

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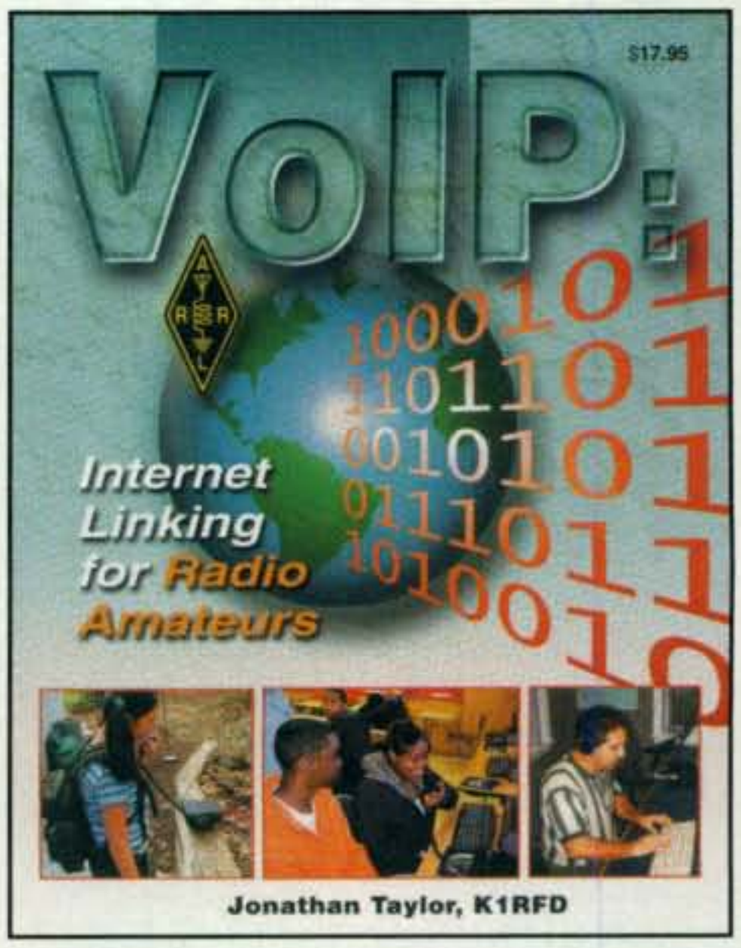
card, speakers, microphone, and an Internet connection. Your PC replaces your radio, and you can link (and speak) to any other user, repeater, or simplex radio that's on the system and not busy. There's no RF path at your end.

The first step to getting onto the EchoLink system is to visit the EchoLink website at <http://www.echolink.org> and download the 2.3-MB self-extracting file to your hard drive. Mac users can use EchoMac by N9YTY, which is compatible with EchoLink (see the Installation FAQ on the EchoLink site for details). Running the installation program starts the easy installation process; just follow the on-screen prompts. Remember to select whether you planto be a Sysop or User (you can change later).

As the installation ends, the system will start the EchoLink program and find that you are not yet validated to the system and start that process automatically. Every user validation request is reviewed manually by volunteers, which may take "up to a day or less than an hour," so please be patient. Validation is a method used to verify that you are who you say you are, which helps prevent non-hams from accessing the system. After a few minutes I received an e-mail stating that N2IRZ appeared to be a valid callsign, and could I please verify my identity by sending in a clear copy of my amateur radio license, either by fax or by scanning and sending an e-mail. I chose to send the e-mail, since phone calls cost me a nickel a minute. About an hour later I received a message that my callsign was validated.



Jonathan Taylor, K1RFD's new book VoIP: Internet Linking for Radio Amateurs, *published by the ARRL, explains the detailed "nuts-n-bolts" of how radio amateurs are using VoIP technology today. Jonathan is also the developer of EchoLink.*

Once you've been validated, you should first try a connection to the Test Server, which is easily found on the "Station" menu and repeats everything back to you. This will help you spot and correct any problems before you go out into the real world. You'll probably find that you need to open up some UDP ports in your firewall and/or router; the EchoLink help feature that pops up the first time it happens explains this fairly well. It covers the most popular software firewalls and broadband routers. If necessary, there's even a troubleshooter utility you can download.

This was the trickiest part for me. I had to puzzle over this for a few hours until I figured out which setting was the key. With my LinkSys wired router, I decided to set up the router for Port Triggering, instructions for which I found on the LinkSys support site. The EchoLink help feature spoke about Port Forwarding, which require my router to use static IP routing (which I didn't want), but when I reviewed the instructions at LinkSys, they directed me to Port Triggering.

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The issue, in a nutshell, is this: Your router and software firewalls (which, if you are a regular reader, you surely use) are set up to block all data from entering any "ports" on your computer that are not specifically opened. This helps prevent external attackers from accessing your system. EchoLink requires two ports, 5198 and 5199, to be open to incoming UDP data. Port Forwarding opens these ports and directs the incoming data to a specific computer on your LAN. That's why you need static IP addresses, so the router knows which computer is which. Port Triggering leaves these ports closed to incoming data until a program (such as Echolink) sends data *out* of those ports. Thus, until you start up EchoLink, the ports remain closed—a bit more secure.

If you have difficulty with this issue, I again urge you to read the troubleshooting documentation carefully; the solution really is in there. You just have to find it.

After you get it working, connect to the Test Server and set up your incoming and outgoing audio quality. There are a few settings on the Tools/Setup/ Audio menu, and you should try them all until you find the best combination for "on-the-air" sound quality for your station.

Getting on the air involves simply picking a station and connecting to it. From the Sysop side, you log into EchoLink and connect your radio or repeater to EchoLink, inviting others to use it. Local users use DTMF tones to connect and manage a QSO with another EchoLink station, or distant users connect into your system and their voice is transmitted on your radio. Some basic commands to connect to or find a specific EchoLink "node," or to connect to a random node, are included with the EchoLink application. Note that you really should be the operator of a repeater to link it into the system, or at least have permission and authorization from the repeater owner. A busy repeater is a poor candidate for linking. There are already too many users!

Before signing up as Sysop, I recommend becoming familiar with the system as a user, which is in itself a lot of fun. Some statistics on EchoLink: Currently (10/04) there are 137,573 validated, licensed users, 49% of which are in the U.S. They validate about 130 new users per day. The top 10 countries are USA, UK, Canada, Germany, Brazil, Japan, France, Italy, Australia, and Spain. Some 35% of the users are in a country where English is not the primary language.

If you want to learn more about the way VoIP works and is being used today by amateurs, pick up the book *VoIP: Internet Linking for Radio Amateurs* by Jonathan Taylor, K1RFD, who is also the author of EchoLink (ISBN 0-87259-926-4, $17.95, published by ARRL). It is a good book which explains the technology in a friendly, easy-to-read style and covers some of the finer points of setting up a station.

Holiday Wishes

That's all for this year. Next time I hope to take a close look at a few HF data modes, their performance and efficiency, as well as a new way of classifying the signal quality of PSK31 contacts using an "RSQ" report.

As is my custom this time of year, I wish you and your family & friends the very best for the holiday season, and hope you enjoy a happy, healthy, and prosperous New Year. This time of year causes the world to think more about peace, and regardless of your personal political and religious beliefs, I think most of us can agree that living in peace is one of the best ways to live.

73, Don, N2IRZ

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BY FREDERICK O. MAIA,* W5YI

Amateur Radio and RF Safety—What You Need to Know

"We find it to be the duty of the licensee of an amateur station to prevent the station from transmitting from any place where the operation of the station could cause human exposure to levels of RF radiation that are in excess of the limits we are adopting." —*FCC in ET Docket 93-62*

Are you aware that all radio amateurs applying for a license, including those who upgrade or renew, routinely certify on their license applications that they have read and are familiar with the FCC's rules regarding RF exposure? It is in the fine print directly above where you sign your application. However, just how familiar with them are most hams?

Do terms such as "thermal" effects, RF electromagnetic fields, non-ionizing radiation, power density, Specific Absorption Rate (SAR), routine RF safety evaluation, time-averaging, controlled/uncontrolled environments, and such confuse you? You are not alone!

This month let's discuss the FCC's rules concerning RF safety. They can be very complex, so we will try to de-mystify the subject as much as possible.

Radio-Frequency and Microwave Radiation

Amateur transmitters, like all radio transmitters, send information from one place to another by scattering electromagnetic waves into space. Electromagnetic radiation consists of waves of electric and magnetic energy moving together through space at the speed of light.

A wavelength is defined as the distance in meters between corresponding points of two successive electromagnetic waves at a specific frequency. The RF waves emanating from an antenna are generated by the movement of electrical charges in the antenna. Electromagnetic waves can be characterized by a wavelength and a frequency.

The electromagnetic "spectrum" includes all of the various forms of electromagnetic radiation, ranging from extremely-low-frequency (ELF) signals (with very long wavelengths) to x-rays and gamma rays, which have very high frequencies and extremely short wavelengths.

In between these extremes lie radio waves, microwaves, infrared radiation, visible light, and ultraviolet radiation. Radio-frequency (RF) electromagnetic fields (EMFs) can range from low frequency, such as 60-Hz electric-power-line frequency fields, to microwave radio energy, which is much higher in frequency. Magnetic fields are created whenever electric current is flowing. Power-line EMFs are produced when electric currents flow along a wire. The energy released by oscillating EMFs is called *electromagnetic radiation,* or *EMR.*

Radio waves and microwaves emitted by transmitting antennas are one form of electromagnetic energy. Many uses have been developed for RF energy, but carrying telecommunications is its most common and important use. Different forms of electromagnetic energy are categorized by their wavelengths and frequencies. The RF part of the electromagnetic spectrum is generally defined as that part of the spectrum where electromagnetic waves have frequencies in the range of about 3 kilohertz (3 kHz) to 300 gigahertz (300 GHz).

Microwaves are a specific category of radio waves with frequencies ranging from several hundred MHz to several GHz. Microwave radiation is a form of RF radiation which occupies the upper part of the RF electromagnetic spectrum above 300 MHz.

Radio Waves Can Heat Tissue

The energy associated with electromagnetic radiation depends on its frequency: The greater the frequency (and shorter the wavelength), the higher the energy. Therefore, solar radiation, x-rays, and gamma rays, which have extremely high frequencies, also have relatively large amounts of energy. At the other end of the electromagnetic spectrum, extremely-low-frequency (ELF) radiation is far less energetic.

Of the various forms of electromagnetic radiation, x-radiation and gamma radiation represent the greatest relative health hazard because of their greater energy content and correspondingly greater potential for biological damage. In fact, x-rays and gamma rays are so energetic that they can cause ionization of atoms and molecules and thus are classified as "ionizing" radiation. Ionization is a process by which electrons are stripped from atoms and molecules, producing molecular changes that can lead to significant genetic chromosome damage in biological tissue. It can actually break apart DNA, the building blocks that make up our genes. Nuclear weapons, for example, produce enormous amounts of ionizing radiation.

Less energetic forms of electromagnetic radiation, such as low-frequency and RF radiation, lack the ability to ionize atoms and molecules and are classified as "non-ionizing" radiation. Their frequency is too low to produce enough photon energy to ionize atoms. Ionizing and non-ionizing radiation are separated on the electromagnetic spectrum by visible light. Thus, the frequency of

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non-ionizing EMR extends from the very low frequencies (VLF) to the infrared region.

How is RF Energy Used?

Radio and television broadcasting, cellular telephones, personal communications services (PCS), pagers, cordless telephones, business radio, radio communications for police and fire departments, amateur radio, microwave point-to-point links, and satellite communications are just a few of the many telecommunications applications of radio-frequency energy.

Microwave ovens, which rely on the principle that microwaves generate heat throughout an object rather than just at the surface, are a good example of a non-communication use of RF energy. Radio-frequency radiation, especially at microwave frequencies, can transfer energy to water-rich materials such as most foods. Therefore, microwave ovens can cook food more rapidly than conventional ovens. Strict manufacturing safety rules apply to microwave ovens to ensure that the RF energy stays inside the appliance.

Another important non-communication use of RF energy is for radar, a valuable tool used in many applications, from traffic enforcement to air-traffic control and military applications. There are also a number of medical applications of RF energy.

How is RF Radiation Measured?

Now for a little technical stuff. An RF electromagnetic wave, or "field," has both an electric and a magnetic component (electric field and magnetic field). The intensity of the electric field at a given location is expressed in "volts per meter" (V/m). The unit "amperes per meter" (A/m) is used to indicate the strength of the magnetic field.

Another commonly used measure of an RF electromagnetic field is "power density." Power density is most accurately used when the point of measurement is far enough away from an antenna to be located in what is commonly referred to as the *far-field* zone of the antenna.

Power density is defined as power per unit area. For example, power density can be expressed in terms of milliwatts per square centimeter (mW/cm^2) or microwatts per square centimeter ($\mu W/cm^2$). One mW equals one thousandth of a watt (0.001) of power.

The quantity used to measure how much RF energy is actually absorbed in the human body is called the *specific*

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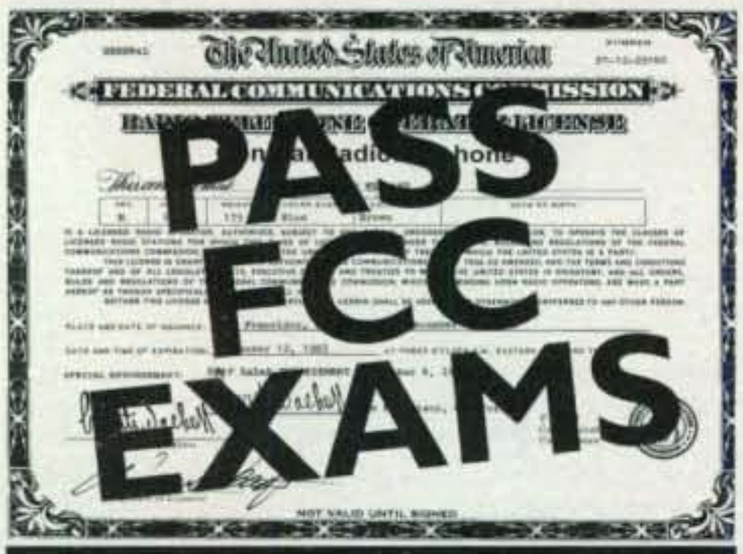

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HF	80 meters	500 watts
	75 meters	500 watts
	40 meters	500 watts
	30 meters	425 watts
	20 meters	225 watts
	17 meters	125 watts
	15 meters	100 watts
	12 meters	75 watts
	10 meters	50 watts
VHF	All bands	50 watts
UHF	70 cm	70 watts
	33 cm	150 watts
	23 cm	200 watts
	13 cm	250 watts
SHF	All bands	250 watts
EHF	All bands	250 watts
Repeater Stations	All bands	•non-building-mounted antennas: height above ground level to lowest point of antenna < 10 m and power > 500 W ERP •building-mounted antennas: power > 500 W ERP

**Power = PEP input to antenna except, for repeater stations only, power exclusion is based on ERP (effective radiated power).*

Table I– A routine RF environmental evaluation is required if the transmitter power of the amateur station exceeds the above limits.

absorption rate, or *SAR*. It is usually expressed in units of watts per kilogram (W/kg) or milliwatts per gram (mW/g).

In addition to intensity, the electromagnetic frequency of RF radiation is important in determining the relative hazard. At a distance of several wavelengths from a source of radiation, a standing human adult can absorb RF energy at a maximum rate when the frequency of the RF radiation is in the (VHF) range of between 30 and 300 MHz. This includes the amateur 6-meter, 2-meter, and 1.35-meter bands. Because of this "resonance" phenomenon, the RF safety guidelines take this frequency dependence into account. Thus, the most stringent standards are in this frequency range of maximum absorption.

Heating of the Human Body

For some time, it has been known that high intensities of RF radiation can be potentially harmful due to the ability of RF energy to rapidly heat biological tissue. Exposure to RF power densities on the order of 100 milliwatts per square centimeter (mW/cm^2) or more can result in heating of the human body and an increase in body temperature.

Two possible harmful effects are RF burns and excessive RF exposure. RF burns occur when a person touches a live antenna or feed line that has high RF power going through it. This is similar to being burned by touching a stove, except that the burn is much deeper. Excessive RF exposure occurs when a person is too close to an antenna transmitting at high power. The higher the power, the more precautions should be taken.

Biological effects that result from heating of tissue by RF energy are often referred to as *thermal* effects. Tissue damage in humans occurs during exposure to high RF levels because of the body's inability to cope with or dissipate the excessive heat that is generated.

The extent of the heating depends on several factors, including the power level and frequency of the radiation, the size of the person exposed, the duration of exposure, and the efficiency of heat dissipation.

If the power level is high enough, RF radiation can cause body heating, which can cause blindness or sterility. Always point your handheld transceiver as far away from your eyes as possible, since the human eye lacks sufficient blood flow to dissipate any excessive heat load.

As a rule, the thermal effects of RF energy generally are not a major concern for most radio amateurs or their neighbors because of our relatively low power levels and the two-way (intermittent low duty cycle) nature of most transmissions. Very few amateurs operate

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their stations "key down" for extended periods of time.

Exposure to RF Energy

Studies have shown that levels of RF energy routinely encountered by the general public in the everyday environment typically are far below the levels necessary to produce significant heating and increased body temperature. However, there may be situations, particularly workplace environments near high-powered RF sources, in which recommended limits for safe exposure of human beings to RF energy could be exceeded.

Some studies have also examined the possibility of a link between RF exposure and cancer. Results to date, however, have been inconclusive. As a general rule, studies have failed to find any evidence of a link between cancer and RF energy. Further research is under way to try to resolve this question.

Exposure guidelines for radio-frequency energy have been developed by various organizations and countries. The current FCC standard specifies two levels of exposure criteria, one tier for "controlled environments" (usually involving workers) and another, more stringent tier, for "uncontrolled environments" (usually involving the general public).

The FCC Guidelines for RF Exposure

The FCC has jurisdiction over all transmitting services in the U.S. except those specifically operated by the federal government. Under the National Environmental Policy Act of 1969 (NEPA), the FCC has certain responsibilities to determine whether its actions will "significantly affect the quality of the human environment." Therefore, FCC approval and licensing of transmitters and facilities must be evaluated, and human exposure to RF radiation emitted by FCC-regulated transmitters is one of several factors that must be considered. In 1996 the FCC revised its guidelines for RF exposure as required by the Telecommunications Act of 1996.

Low-powered, intermittent, or inaccessible RF transmitters and facilities are normally "categorically excluded" from being routinely evaluated for RF exposure. These exclusions are based on calculations and measurement data indicating that such transmitting stations or devices are unlikely to cause exposures in excess of the guidelines under normal conditions of use.

The FCC guidelines for human exposure to RF electromagnetic fields were derived from the recommendations of two expert organizations, the National Council on Radiation Protection and Measurements (NCRP) and the Institute of Electrical and Electronics Engineers (IEEE). The exposure guidelines are based on thresholds for known adverse effects, and they incorporate appropriate margins of safety.

The NCRP and IEEE exposure guidelines identify the same threshold level at which harmful biological effects may occur, and the values for maximum permissible exposure (MPE) recommended for electric and magnetic field strength and power density are based on this threshold level. The threshold level is a specific absorption rate (SAR) value for the whole body of 4 watts per kilogram (4 W/kg).

In addition, the NCRP and IEEE guidelines are different for different transmitting frequencies. This is due to the findings that whole-body human

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absorption of RF energy varies with the frequency of the RF signal. For devices that only expose part of the body, such as handheld radios, different exposure limits are specified.

The exposure limits used by the FCC are expressed in terms of SAR, electric and magnetic field strength, and power density for transmitters operating at frequencies from 300 kHz to 100 GHz.

RF Emissions from Amateur Radio Stations

Like all FCC licensees, amateur radio operators are expected to comply with the FCC's guidelines for safe human exposure to RF fields. Under the FCC's rules, amateur operators may transmit with power levels of up to 1500 watts. However, most hams use considerably less power.

Studies by the FCC and others have shown that most amateur radio transmitters do not normally expose persons to RF levels in excess of safety limits. This primarily is due to the relatively low operating power used by most amateurs, the intermittent transmission characteristics typically used, and the relative inaccessibility of most amateur antennas.

As long as appropriate distances are maintained from amateur antennas, exposure of nearby persons should be well below safety limits. If there were any opportunity for significant RF exposure, it would most likely apply to the amateur operator and his or her immediate household.

To help ensure compliance of amateur radio facilities with RF exposure guidelines, the FCC's Office of Engineering and Technology (OET) has developed a technical publication called OET Bulletin No. 65 "Evaluating Compliance with FCC-Specified Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields." "Supplement B" of this bulletin, a separate publication, specifically applies to amateur radio operators.

Supplement B contains information, tables, and figures that can be used by amateur station licensees in determining whether a station must be evaluated for RF compliance, and if so, how that evaluation can be accomplished. You can download this bulletin and Supplement B from Commission's OET Internet website at <www.fcc.gov/oet/rfsafety>. All amateur radio operators are required to be familiar with its contents.

Evaluating Your Transmitter Power

All amateur transmitters fall under the RF safety rules regardless of power, operating mode, or station configuration. However, the FCC assumes that certain stations are safe without a formal evaluation. These "categorically excluded" transmitters are base-station amateur stations radiating less than 50 watts PEP output and push-to-talk handheld, mobile, or portable transceivers.

Part 97, Section 97.13 of the FCC Rules requires that ham operators perform a routine RF safety evaluation when the power level exceeds certain specified limits (see Table I). Amateurs radiating these higher transmitter power levels are required to evaluate their station parameters (including power output, antenna gain, frequency, distance from the antenna to the populated environment, and duty cycle of the communications) to assure that the maximum permissible exposure (MPE) is not exceeded.

Most amateur stations already meet the MPE limits described in the guidelines, especially when you consider the "time-averaging" aspect. Time averaging is a feature of the exposure guidelines that allows exposures to be averaged over certain periods of time with the average not to exceed the limit for continuous exposure. The averaging time for occupational/controlled exposures is 6 minutes, while the averaging time for general population/uncontrolled exposures is 30 minutes.

Most hams need only to perform a "routine analysis" of their station operation, which can be done by merely comparing their station configuration to a similar station shown in a chart.

The FCC has provided a fill-in-the-blank worksheet (shown as Appendix B of OET Bulletin No. 65, Supplement B) to help in determining whether a routine evaluation is required. It also can be used as an aid in determining compliance. However, use of this worksheet is not required by the FCC.

Another tool (which I developed and is now incorporated as part of FCC's Supplement B; see pages 23 and 24) is a chart that quickly tells you how far away the public should be from an amateur transmitting antenna. This chart gives the estimated distances in meters from a transmitting antenna necessary to meet FCC's MPE power-density guidelines for either occupational/controlled or general-population/uncontrolled exposures. It supplies distances for all ham bands between 160 meters and 23 cm, power levels between 100 watts and 1500 watts and typical antenna gains. The chart assumes a 100% duty cycle, a worst-case scenario, which is hardly the case. In reality, a normal duty cycle would be less than 50% during a typical back and forth communication exchange, and even less if SSB or Morse code is used.

Once you determine your output power to your antenna, you can easily determine the needed separation distance to the controlled and uncontrolled environment by using the W5YI tables. For 99% of all amateur stations, these are the only two tools that you will need.

Furthermore, the "controlled" and "uncontrolled" RF exposure limits are time-averaged over 6- and 30-minute time periods. It ths is permissible to exceed the recommended limits as long as the average exposure over the time period does not exceed the limits. The premise of time averaging is that the human body can regulate the thermal load caused by high localized RF exposures for short periods of time.

What You Can Do to Reduce RF Exposure to the Public

If the routine environmental evaluation indicates that the RF electromagnetic fields could exceed the RF safety guidelines in accessible areas, the licensee must take action to prevent excessive

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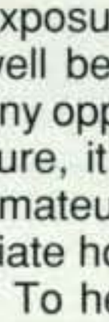
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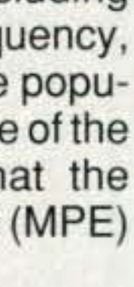
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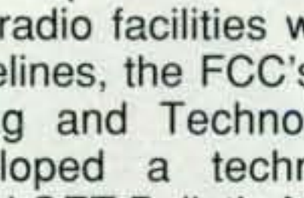
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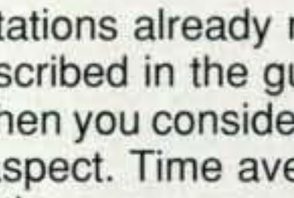
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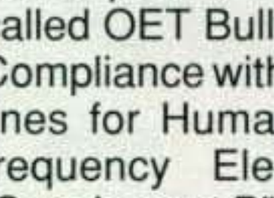
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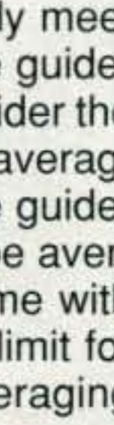
DJ-V5

human RF exposure. To minimize RF exposure to the public:

• You should radiate as little RF power as possible. The power level regulations have always required amateurs to use the least amount of transmitter power necessary to perform their communications.

• Make it a practice to operate without your linear amplifier whenever possible.

• Never use an amplifier that has its shielded metal cover removed. The cover keeps RF energy from escaping into the environment.

• Reduce the duty cycle. Keep transmissions short , especially when operating at the VHF/UHF/microwave level.

• Transmitting antennas should be mounted as far away from residences and populated areas as possible—and the higher the antenna the better.

• Since feed lines can radiate, route open-wire line (or even coaxial cable if the standing wave ratio is high) away from populated areas.

• Do not transmit when people are near a ground-mounted or mobile antenna.

• Vertical antennas are best installed on monopoles, towers, or roofs, and not at ground level.

• Locating mobile antennas in the center of a metal roof is preferable to window-mounted installations.

• A good rule-of-thumb to follow is to allow at least 35 feet of distance between the antenna and the environment if 100 watts or more is being transmitted. Also allow an even greater distance if you transmit with high-gain antennas at the high-energy VHF/UHF frequencies!

• Don't transmit if anyone is within five or six feet of a whip antenna.

• Be careful when using indoor antennas, including those mounted in attics, because they can generate substantial RF fields.

• Use low-power (10 watts output or less wherever possible) and keep your transmissions short when someone might be near the antenna.

• Do not use high-power VHF/UHF or microwave transmitters and high-gain directional antenna arrays such as used during moonbounce or weak-signal communications in a residential environment.

• Never look into the open end of an activated waveguide or stand in front of a high-gain VHF/UHF antenna array when the transmitter is on.

• Always use the lowest power level possible when using a handheld transceiver and point the antenna as far away from your head—and especially the eyes—as possible.

• Amateurs can also minimize the amount of RF energy radiated into the surrounding environment by changing frequency bands and using lower duty-cycle emission types such as single sideband and CW.

• Limiting access to your antenna site (such as a fenced-in yard) may be the easiest method to reduce exposure. Also consider erecting warning and/or notification signs.

That, in a nutshell, is what the FCC's RF exposure rules are all about, when you need to analyze potential exposure of other people to RF radiation, and steps you can take to minimize that exposure. Again, as we said in the beginning, every amateur is required to be familiar with and abide by the FCC's rules in this area. Hopefully, with this explanation you will be able to better understand the rules and determine your need for making measurements or taking corrective action.

73, Fred, W5YI

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what's new

BY KARL T. THURBER, JR.,* W8FX

'Tis the Season!

'Tis the season, indeed! This month we again shine the *CQ* product spotlight on new radio gear, shack accessories, antennas and antenna accessories, portable and mobile goodies, and more—including some items we think will be of special interest to you in this holiday season.

Radio Gear

RFSPACE SDR-14 Software Defined Radio Receiver. Should an SDR (software defined receiver) be on your high-tech holiday wish list? RFSPACE's new SDR-14 (see photo A) is a good candidate, a 14-bit SDR that's actually a combination SDR and spectrum analyzer. The unit receives from DC to well over 200 MHz, sends the data to a PC using a USB interface, and then uses the PC to do all the signal processing.

Currently supported formats include USB, LSB, AM, FM, WFM, CW, CW-R (CW reception using opposite sideband selection), and DSB. Also, the DRM (Digital Radio Mondiale) standard is now supported via a special demodulation mode using the free third-party DREAM software (see <http://www.drm.org>). The radio's filter bandwidths are continuously adjustable.

The SDR-14 comes with a high-frequency (HF) amplified front end with switched attenuators and 1 Hz tuning. A direct input port to the analog-to-digital converter (ADC) also is included; the port can be used to sample signals directly to over 200 MHz.

One of the most exciting SDR-14 features is the ability to record band segments of any band to your hard drive in real time. The stored file contains everything that happened in that segment of the band for the duration of the recording. The recording can be played back at any time with full tunability and choice of demodulation modes, and it also can be analyzed for hidden signals and carriers. File fidelity is said to be superb.

The SDR-14 uses Windows®-based software for all of the display and demodulation functions. Included in the package is the latest version of the SpectraVue software by MoeTronix (<http://www.moetronix.com>), which works under Windows® 98, 2000, and XP. Of special note for those adventurous folks who may write their own software to use with the SDR-14, both Windows® and Linux drivers, as well as an ActiveX control, are supplied. Windows® and Linux server application software is included with the package to allow networked operation.

The possible applications of the SDR-14 are many. Some of these include: use as a panoramic adapter for communications receivers; radio astronomy spectral analysis; ionospheric and band propagation monitoring; interference surveying; power, noise, and antenna measurements; law enforcement and homeland security; searching for

Photo A– RFSPACE's new SDR-14 is a 14-bit software-defined receiver (SDR) that is actually a combination SDR and spectrum analyzer. The new unit receives from DC to well over 200 MHz. The SDR-14 reports an impressive list of capabilities that are discussed in this month's column. Be sure to check it out. (Photo courtesy RFSPACE)

coherent signals hidden in noise; educational usage; and more.

The SDR-14, priced at $999 plus s/h, includes everything that's needed: the SDR-14 hardware, SpectraVue software on computer CD, a USB cable, and a 12-VDC wall transformer. All items carry a 15-day money-back guarantee and a 1-year warranty.

For further information, contact RFSPACE, Inc., P.O. Box 3356, Lilburn, GA 30048 (770-456-5476; e-mail: <info@rfspace.com>; on the web: <http://www.rfspace.com>). The RFSPACE website does a good job of explaining the SDR-14 SDR and the complex technology behind it; you also can download a free version of the SpectraVue software as well as demo files from the site. The SDR-14 also

Photo B– West Mountain Radio's Computerized Battery Analyzer, or CBA, is said to be a "must have" tool for anyone who depends on batteries. For the first time and for a reasonable price, anyone can easily perform and interpret scientific tests of batteries. See the column text for details. (Photo courtesy West Mountain Radio)

*289 Poplar Drive, Millbrook, AL 35054-1674
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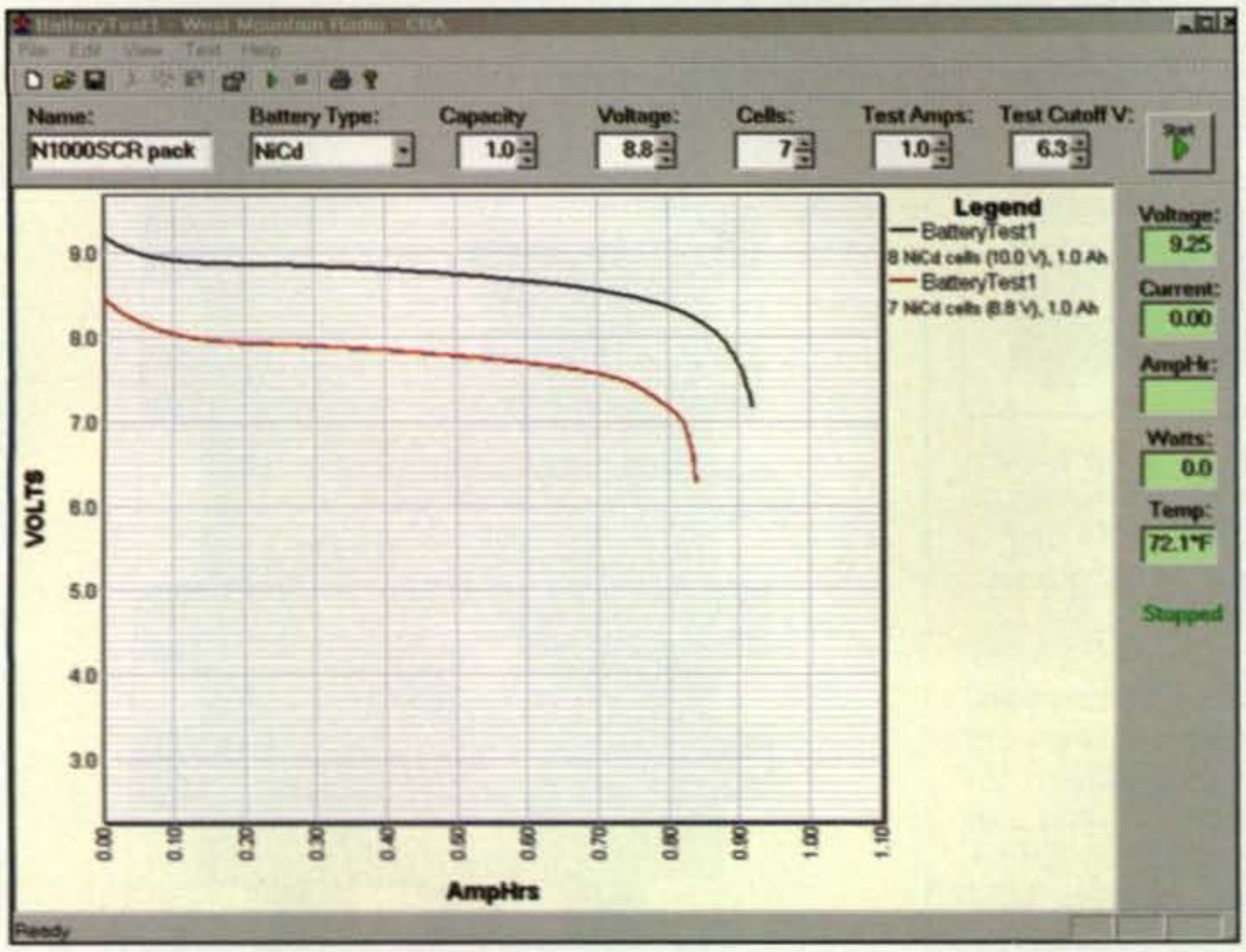

Fig. 1– The CBA from West Mountain Radio measures battery capacity in amp-hours and graphically displays test graphs on a standard USB-equipped Windows® computer. Battery test-graphs can be displayed, saved, printed, or overlaid and compared. (Screen image courtesy West Mountain Radio)

is sold by Universal Radio, Inc. (go to <http://www.universalradio.com>).

Accessories for the Radio Shack

CBA from West Mountain Radio. New from West Mountain Radio is the Computerized Battery Analyzer, or CBA for short. Unlike a simple load tester, the $89.95 CBA does a constant current test of virtually any type or size of battery, measuring the capacity in ampere-hours and graphically displaying test graphs on a standard USB-equipped Windows®-based computer (photo B and fig. 1). The CBA is said to test literally any battery up to 48 volts, 40 amps, or 150 watts, whichever is higher, and measure battery temperature with an optional temperature probe.

You can display, save, print, overlay, and compare battery test graphs, and print test labels. Anyone can look at the screen and see the "personality" and performance of your batteries. You can find out if you got what you paid for, see battery aging over time, match cells, and compare packs. You also can condition, rejuvenate, and balance packs, and instantly see the results.

The CBA is compact and rugged, it has a quiet fan and LED indicators, and it's supplied with a USB cable and software on CD-ROM. The Windows® plug-and-play USB interface makes it easy to con-

Photo C– The DX Engineering TB-1P Tilt Base mounting plate, depicted here, lets you raise or lower Hustler BTV, Cushcraft, and Butternut vertical antennas in seconds while leaving the base securely attached to the mounting post. The complementary RADP-1P radial plate also is shown in the photo. (Photo courtesy DX Engineering)

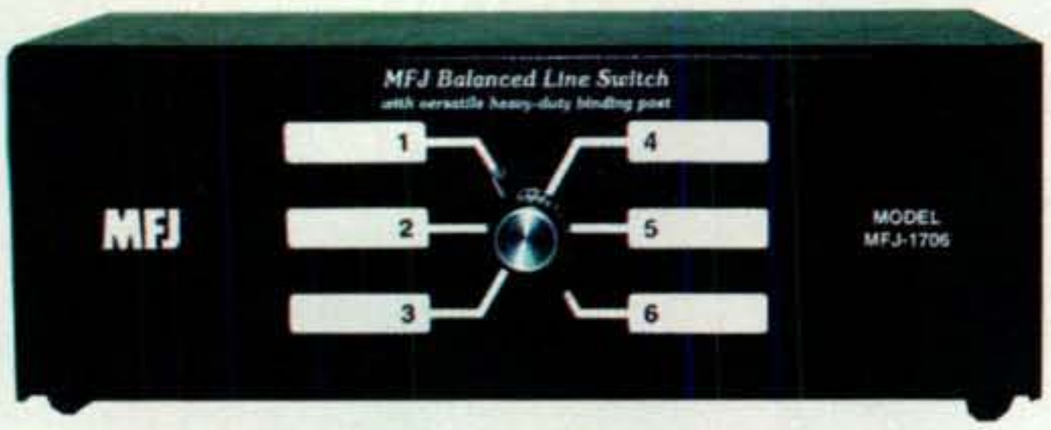

Photo D– The MFJ-1706 6-Position Balanced Line Switch lets you use one of six different balanced antenna feedlines, over the range 1.8 to 30 MHz. The $89.95 MFJ unit is equipped with heavy-duty, versatile, five-way binding posts. (Photo courtesy MFJ Enterprises)

Photo E– Check out the MFJ-1700C "New and Improved" 6-Position Transceiver/Antenna Switch. It improves on the popular MFJ-1700B switch by adding lightning surge protection and better isolation. With the new switch, you can select one of six different antennas and match to one of six different rigs, in any combination. (Photo courtesy MFJ Enterprises) →

nect and install, and the supplied software is easy and intuitive to use, being designed so anyone can safely and easily do lab-quality tests.

For more information, or to order, contact West Mountain Radio, 18 Sheehan Avenue, Norwalk, CT 06854 (telephone 203-853-8080; e-mail: <sales@westmountainradio.com>; on the web: <http://www.westmountainradio.com>).

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Antennas and Antenna Accessories

TB-1P Tilt Base from DX Engineering. Okay, so maybe it's a bit large to be a casual holiday stocking-stuffer. Nevertheless, here's a clever device for vertical antennas that may intrigue you, just as it did us. The DX Engineering TB-1P Tilt Base mounting plate enables operators to raise or lower Hustler BTV, Cushcraft, and Butternut vertical antennas in seconds while leaving the base securely attached to the mounting post.

The one-man tilt design dramatically reduces the effort it takes to adjust your antenna. Just loosen the flange nuts, lift, and tilt. The Tilt Base also eliminates the need to climb ladders or fumble with brackets. Constructed with quarter-inch 6061-T651 aluminum alloy, the TB-1P mounting plate resists corrosion and complements the DX Engineering RADP-1P radial plate (both shown in photo C). The price is $39.95.

For more information, contact DX Engineering, P.O. Box 1491, Akron, OH 44309 (1-800-777-0703; e-mail: <dxengineering@dxengineering.com>; web: <http://www.dxengineering.com>).

New Gift Goodies from MFJ. The innovative folks at MFJ once again have come up with several interesting antenna accessories we would like to bring to your attention this month. The good news is that at least some of these goodies should even fit in the proverbial holiday stocking.

First up is the MFJ-1706 6-Position Balanced Line Switch (photo D). This antenna switch lets you use one of six different balanced feedlines, over the range 1.8 to 30 MHz. The $89.95 unit is equipped with heavy-duty, versatile, five-way binding posts, and it handles the legal power limit. A variant of this switch is the MFJ-1706H switch, which is similar but has high-voltage, glazed-ceramic feedthrough insulators.

Next up is the MFJ-1700C "New and Improved" 6-Position Transceiver/Antenna Switch (photo E). This switch improves on the popular MFJ-1700B switch by adding lightning surge protection and better isolation than its predecessor. With the MFJ-1700C you can select one of six different antennas and match to one of six different rigs, in any combination. The switch handles 2 kW PEP SSB power over the range 1.8 to 30 MHz. It's intended for use with 50–75 ohm transmission lines.

Last up this time is the MFJ-1401 Mobile Antenna Ground Plane Kit (photo F), which converts most mobile antennas into a ground-plane base-station antenna. Handling 200 watts, the kit accepts VHF and UHF mobile antennas with a PL-259 connector. The kit includes stainless-steel mounting hardware, two hose clamps, an Allen wrench, and four 20.5-inch radials. MFJ says it's easy to install on any 2-inch pipe with clamps or mounting holes.

Before moving on, we should state that all the MFJ products we mentioned here are covered by the company's

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R-20-06 Covers AM/FM radio, TV broadcasts, wireless communications for boaters, aviation, conventional public safety, etc. (0.15-3304.99MHz, cell blocked). Features a digital recorder. 11 hours continuous receive. 2.28"w x 5.5"h x 1.22"d

R-3-26 Covers 0.5-2450MHz (cell blocked). Shows operation status, broadcast visual information (TV, sporting event cameras, security, and amateur TV) on 2" color display. 2.41"w x 4.72"h x 1.28"d, 10.6 oz

R-10-05 Coverage from 0.5MHz– 1300MHz (cell blocked) with all mode receive capability. 5.1"h x 2.3"w x 1.2"d, 11 oz

R-5-06 Listen in on car-to-pit calls, look for sites while traveling, or catch a favorite program at home (0.015-1309.995MHz, cell blocked). 3.38"h x 2.28"w x 1.06"d, 6.5 oz

PCR-1000-02 BON Lap/desk top PC-compatible, packaged with the Bonito Software. Listen in on broadcast radio, television, ham stations, marine, aviation and more (0.5 to 1300MHz, cell blocked). 1.19"h x 5"w x 7.84"d, 2.2 lbs

laptop not included

R-8500-02 Super wide band, all mode coverage from HF to 2GHz (cell blocked), including shortwave and VHF/UHF. 11.3"w x 4.4"h x 12.2"d, 15.4 lbs

R-75 Covers 0.03 to 60MHz. Use conveniently in a ham shack, den or vehicle. 9.5"w x 3.69"h x 9.03"d, 6 lbs, 10 oz. Comes with **FREE UT-106*** DSP unit.

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IC-746PRO 100W, 102 memories, and a multi-function LCD command the HF/50/144MHz 746PRO. 24-bit AD/DA converter and digital noise reduction. 11.3"w x 4.7"h x 12.5"d, 19 lbs, 13 oz. FREE PS-125 with purchase.

IC-706MKIIG The 160-10M + 6M, 2M, 70cm Mark II G is constructed for stable, quality output with low IMD and spurious emissions. Tone squelch, DSP, auto repeater and 107 memories. 6.56"w x 2.28"h x 7.88"d, 5 lbs, 6 oz. FREE RMK706 with purchase.

IC-756PROII All-mode, HF, 50MHz PROII offers 32-bit floating DSP, 24-bit AD/DA converter, selectable IF shape, and adjustable noise blanker. 13.38"w x 4.38"h x 11.2"d, 21 lbs, 1 oz. FREE PS-125 with purchase.

IC-756PROIII Same as PROII with improved 3rd order intercept, better roofing filter, improved DSP, less distortion on rx, and more. $2999.99

IC-2200H 65W and new digital features. With a familiar 2100H interface, the 2M 2200H adds optional digital capability providing modulated and demodulated clear voice and data. Also offers 207 memories with DMS, standard CTCSS/DTCS en/decode, weather channel/alert, and FM narrow. 5.5"w x 1.56"h x 5.75"d, 2.75 lbs.

IC-718 With the performance of the HF all-band 718, such as wide dynamic range, high S/N ratio, and full duty operation, making distant contacts is easy. 9.44"w x 3.75"h x 9.41"d, 8 lbs, 6 oz. FREE UT106 with purchase.

IC-703PLUS For QRP enthusiasts. The 160-10M, 6M 703PLUS is capable of 5/10W and focuses on QRP. A portable HF unit featuring relay-type antenna tuner, low current consumption, DSP, memory keyer and 105 memories. 6.56"w x 2.28"h x 4.88"d, 4.4 lbs

IC-910H 100/75W stable output. 2M/440MHz base provides 9600bps, satellite support. 9.5"w x 3.69"h x 9.4"d, 9.9 lbs.

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IC-2720H The 2M/440MHz, 50/35W 2720H offers simultaneous rx capability, independent band controls, and DMS with 212 memories. Also has CTCSS/DTCS, wide rx, auto repeat, remote mic and remote control head (mnt. opt.). 5.5"w x 1.56"h x 7.38"d, 3 lbs. (main)

IC-V8 The polycarbonate and diecast aluminum 144MHz, FM, 5.5W V8 offers 100 memories and standard CTCSS/DTCS and DTMF. 2.13"w x 5.19"h x 1.38"d, 12.3 oz.

IC-T7H A 6W amp circuit provides superior transmit on VHF/UHF when 13.5V DC is supplied. In addition, 500mW of AF is output. Separate CTCSS tone encoder and enc/decoder standard. 2.25"w x 4.34"h x 1.06"d, 10 oz.

IC-T2H SPORT The 6W T2H Sport meets MIL SPEC for shock and vibration and is more than enough for long distance communications. The 2M handheld boasts tone squelch, customizable keys, DTMF encode, 40 memories, 10 weather channels and cloning. 2.3"w x 5.5"h x 1.3"d, 14.8 oz.

IC-2100H-25N The 2100H25N offers 50W on transmit, extending its range. It also features CTCSS tone enc/decode, tone scan and 100 alphanumeric memories. Remote controlled using backlit mic. 5.5"w x 1.56"h x 7.09"d, 2 lbs, 10 oz.

IC-W32A User-friendly, independent band controls. (right) The 5W, 2M/440 W32A meets novice or experienced demands: simple use, advanced features. Simultaneous receive, 200 mem. 2.25"w x 5.41"h x 1.31"d, 1 lb.

IC-T90A Compact, full featured. 50/144/440MHz T90A offers wide-band rx with 5W. Features 555 memories with DMS scanning. Also provides DTCS/ CTCSS, DTMF encode, PC programmability and weather resistance. 2.53"w x 3.44"h x 1.16"d, 8.47 oz.

IC-V8000 Offers 75/25/10/5W output. With clear, operator-facing speaker, the 2M features CTCSS/DTCS, DTMF encode and 207 memories. 5.9"w x 1.97"h x 5.9"d, 2.22 lbs.

IC-208H This 2M/70cm mobile provides 55/50W, plus reduced power for local. The 208H covers 118-173, 230-549 and 810-999MHz (cell blocked) rx as standard. Improved DMS, detachable front, and 500 memories. 5.56"w x 1.56"h x 7.31"d, 2.65 lbs.

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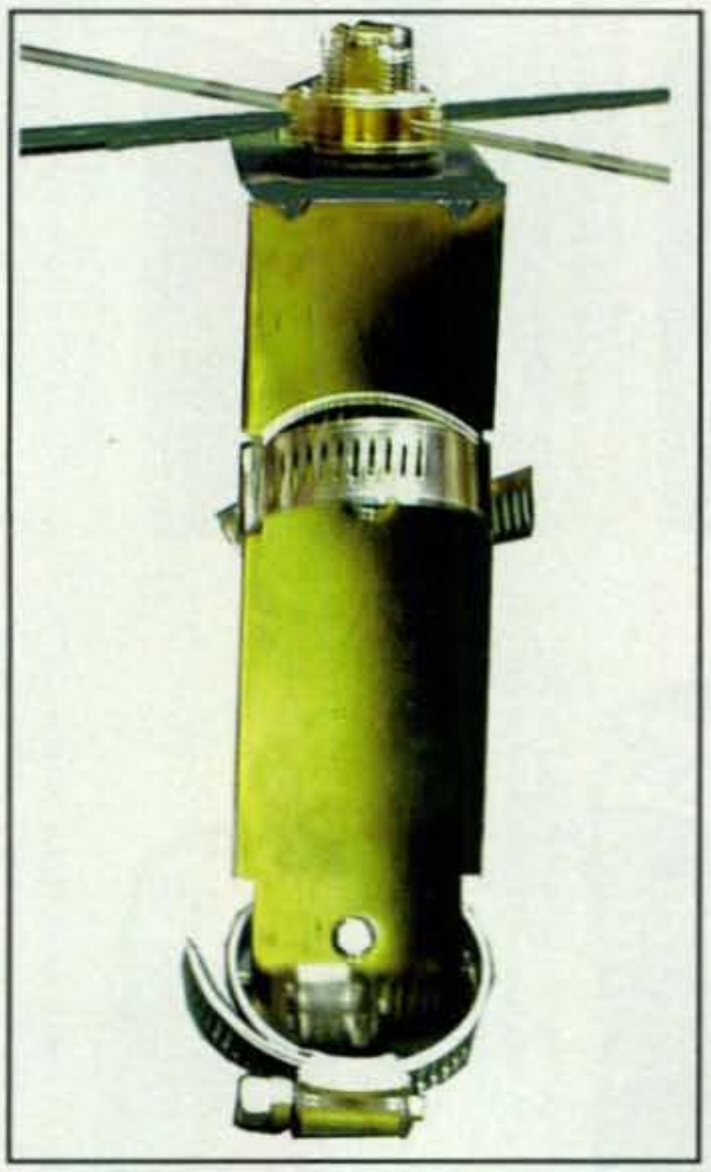

Photo F– The new MFJ-1401 Mobile Antenna Ground Plane Kit is a handy device that converts most mobile antennas into a ground-plane base-station antenna. Handling 200 watts, the kit accepts VHF and UHF mobile antennas with a PL-259 connector. (Photo courtesy MFJ Enterprises)

Portable and Mobile

FRP Composite Fiberglass Mast Kits from Barker & Williamson. These "stealth" tactical support masts are designed for fast antenna deployment, base or roof mounted, for NVIS (Near Vertical Incidence Skywave), local, and DX operation.

The folks at Barker & Williamson say they "searched the world" for a good tactical support for their antennas. They couldn't find one, so they made our own! These mast kits (photos G and H) were made with the soldier in mind, so they offer military-grade features, locking, and camouflage. However, the kits also can be a good choice for government, emergency operations center (EOC), FEMA, MARS, CAP, ARES, RACES, and other field use.

The mast poles are made in 4-foot sections; tactical units are rapidly field-assembled with a joiner and pinned together. The pins are attached to the poles with lanyards so they won't get lost. A locator pin is hammered into the ground to stabilize the bottom of the assembly, a guy ring is placed on top, and lines are run down to ground stakes. The guy lines have easy-to-use tensioners and snap hooks for your convenience.

Photo G– Barker & Williamson says it "searched the world" for a good tactical support for their antennas. They couldn't find one, so they made their own. Here's a view of a typical FRP Composite Fiberglass Mast Kit installation. The handy kits are said to be both easy to ship and easy to carry. (Photo courtesy Barker & Williamson)

The material used for the pole sections is quite interesting. It's a composite known as FRP, or fiberglass reinforced plastic. Unlike cheap "fishing pole" material, it's extremely lightweight, strong, and rigid. Also, the color is dispersed throughout the material, so there's no paint to chip.

Other mast-kit features include bot-

Photo H– The new Barker & Williamson FRP Composite Fiberglass Mast Kits include the poles, pins, camo carry bag, hammer, and preassembled guy lines—just about everything you'll need. The pole kits break down to just 4 feet in length. (Photo courtesy Barker & Williamson)

Photo I– The World Pack-706 from Cutting Edge/PowerPort is designed for the ICOM IC-706 or IC-703 radios. The pack itself is constructed of a laminate of heavy-duty nylon, 1/4-inch closed cell foam padding, semi-rigid polyethylene board, and a smooth nylon interior. More details are found in this month's column. (Photo courtesy Cutting Edge Enterprises)

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tom locating pins turned from aircraft aluminum and ground stakes made from thermoplastic, to avoid rust. All guys and lines utilize polyester, which shouldn't stretch, rot, or degrade under UV exposure.

Reportedly, one person can set up a 12-ft. mast section in just five minutes; the 24-ft. mast requires two persons, minimum, for installation. Complete tactical kits include the poles, pins, camo carry bag, hammer, preassembled guy lines—in other words, just about everything you'll need. Small and light, all of the pole kits break down to just 4 feet in length. Easy to ship and carry, a complete 12-ft. mast kit weighs just 10 lbs. and creates no shock hazards. Camouflage is available in forest green and sand colors.

Photo J– The World Pack-706 is designed to give you full access to your radio controls for QRP operations while mobile. The remote-head belt-case is zippered for easy access and padded for protection of the radio head. (Photo courtesy Cutting Edge Enterprises)

Contact Barker & Williamson, 603 Cidco Rd., Cocoa, FL 32926 (phone 321-639-1510; e-mail: <custsrvc@bwantennas.com>; web: <http://www.bwantennas.com>).

WorldPack-706 from Cutting Edge Enterprises. Cutting Edge Enterprises is well known for its broad line of PowerPort radio pouches, cases, and related accessories. In fact, it seems as if every time a new radio enters the marketplace, the folks at Cutting Edge have a new design ready to fit and carry it in style. This time, it's the Cutting Edge/Powerport WorldPack-706.

The new WorldPack-706 is designed specifically for ICOM radio users. The pack comes with a new remote-head belt-case for the IC-706 or IC-703 radios to give you full access to your radio controls for QRP operations while mobile. The remote-head belt-case is zippered for easy access and padded for superior protection of your radio head. You can carry the case on your belt or attach it to the shoulder strap, or wherever it's most comfortable. Photos I and J present views of the WorldPack-706 along with its custom remote-head case.

The $69.95 pack is constructed of a laminate of heavy-duty nylon, closed-cell foam padding, semi-rigid polyethylene board, and a smooth nylon interior. The upper compartment holds the radio, and the lower one can hold the beefy 12-volt, 8 amp-hour WorldPack Power Kit offered as an option. All radio power and antenna connections are accommodated.

The backpack's compartments have double protection against the weather and dirt—rain-flapped zippers and an interior waterproof nylon rain fly with drawstring closure. The rain fly allows you to protect your radio, even when the waterproof lid is up. The lid has a pocket for your microphone, and comes with a complementary PowerPort "WindSock" fleece cover for the mic, to attenuate mic wind noise.

Besides these features, there are numerous tie-down points to attach gear, and two antenna pockets on the sides hold and support various mobile antennas. The shoulder straps are comfortable, well-ventilated mesh with webbing cross-straps to hold HTs, GPS units, or other handheld devices.

For more information, or to place an order, contact Cutting Edge Enterprises, 1717 Seventh Street, Lost Osos, CA 93402 (1-800-206-0115; e-mail: <info@powerportstore.com>; web: <http://www.powerportstore.com>).

Wrap-Up

That's all for this time, gang. Next time more "What's New." See you then.

Overheard: Okay, it's that wonderful time of year again. Alas, though, I have heard that ol' Santa reportedly has both good years and bad years.

73, Karl, W8FX

***Note:** Listings in "What's New" are not product reviews and do not constitute a product endorsement by CQ or the column editor. Information in this column is primarily provided by manufacturers/vendors and has not necessarily been independently verified. The purpose of this column is to inform readers about new products in the marketplace. We encourage you to do additional research on products of interest to you.*

Holiday Gifts & Goodies for Hams

BY DAVE INGRAM,* K4TWJ

Season's Greetings to all of our outstanding friends and fans of big-time radio fun near and far! Here's wishing you the absolute best of everything during this festive time of year. Supporting those cheerful good thoughts is a special holiday column highlighting gifts and goodies just for hams. It is a mini-collection of new and unique items destined to please even the most discriminating amateur. No one ever has too much gear, you know. There are rigs and accessories for the main station, the den, the bedroom, your car, your spouse's car, for operating portable, for emergency preparedness, and much more. Go for it! The rewards are endless. Maybe we can further pique your enthusiasm with a brief overview of some spiffy new items guaranteed to enhance your life both now and during the coming years. Let's begin with a true crowd pleaser, Alinco's new FM handheld.

New Tiny Talkie

Shirt-pocket-size FM handhelds are oh so irresistibly attractive, especially when traveling, vacationing, and attending hamfests.They are easy to grab and carry anywhere, and they also great for emergency preparedness during these uncertain times. Alinco's new DJ-C7T (photo 1) is a shining example of how much modern radio technology can be squeezed into a small package. It is only 4"H × 2.5"W × .4"D, yet operates 2 meters and 70 cm, plus receives the 118–128-MHz aircraft band, 88–108 FM radio band, 162-MHz NOAA weather band, plus marine, FRS, GMRS, and public-service bands between 148 and 174 MHz and 450 and 500 MHz. Overall performance is also stepped up with 200 "store all" memories; a high-grade speaker; lithium-ion battery pack; SMA antenna connector; CTCSS encoding, decoding and paging; scanning; and more. It is a hot little treat for both hamming and VHF/UHF monitoring. It is available from amateur radio dealers nationwide, and more details are available from Ham Distributors, Inc. at 936-271-3366 or via <www.alinco.com>.

*4941 Scenic View Drive, Birmingham, AL 35210
e-mail: <k4twj@cq-amateur-radio.com>

Photo 1– Nothing brings home the magic of the holidays and the fun of impromptu hamming like a new handheld 2-meter/70-cm transceiver, and Alinco's new DJ-C7T is a prime example. It measures only 2.5" × 4", runs 500 milliwatts, and also serves as a shirt-pocket VHF/UHF scanner supreme. More details are available at <www.alinco.com>.

Photo 2– Here is a handy companion for 2-meter fun on the road: DWM's new Hang Tenna. It is 3.5 ft. tall, covers 144–148 MHz with low SWR, and hangs out with you almost anywhere. (Details at <www.qth.com/dwm>)

Hang Tenna

Looking for a handy portable antenna to use with your new DJ-C7T (or any other transceiver with 2-meter coverage)? Check out the new Hang Tenna from DWM Communications (photo 2). It is 3.5 feet tall, trim like a walking stick, and has end caps

Photo 3– This year's Christmas Key from Morse Express is fashioned like a miniature camelback key. It measures 1.3" × 2.5", sports a "humped" arm, and is 18-carat-gold plated. The little key is an ideal stocking stuffer for pump-key enthusiasts. (Details at <www.morseX.com>)

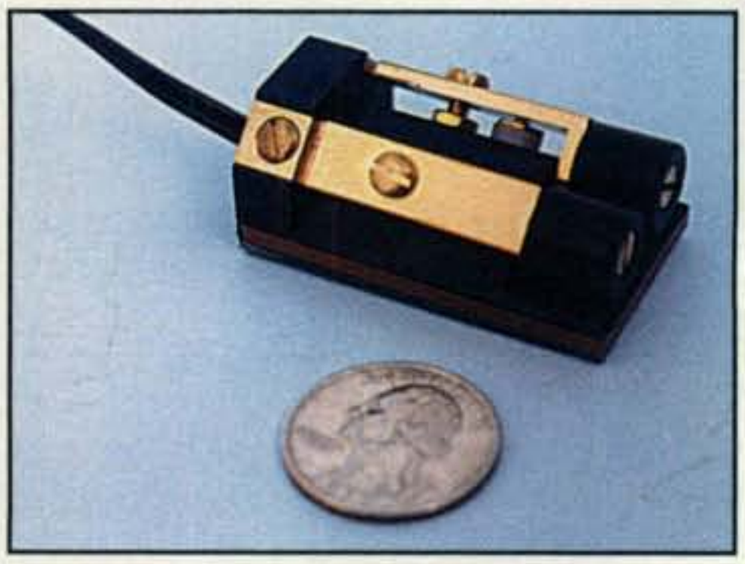


Photo 4– Prefer something a bit more exotic for your CW work? This miniature iambic paddle made by DK1WE sports round fingerpieces and dual levers mounted at 45-degree angles so they respond to vertical, horizontal, or less-than-ideal finger movements. The paddle is especially useful when standing or squeezed into unusual positions. It is available direct from K4TWJ.

with a top hanger on one end. The antenna is pre-tuned, sealed for weather protection, and works almost anywhere—at home, while portable, or even mobile. It comes supplied with 25 feet of coax cable terminated with a PL-259. Add a PL-259-to-SMA adapter cable, and you are set for instant hamming. More details (and antennas!) are available direct from DWM Communications, P.O. Box 87, Hanover, MI 49241; telephone 1-517-563-2613 or e-mail: <tinytenna@hotmail.com>.

Morse Delights

Next in the spotlight are two miniature Morse manipulators with high appeal for home and/or portable operation. First is Morse Express's annual offering of a limited production Christmas Key (photo 3). This year's offering boasts an interesting twist (a hump, actually). The key's arm is fashioned like the classic camelback key used on telegraph lines during the 1860s and 1870s. The miniature camelback is approximately 1.3" × 2.5", is brass with 18-carat gold plating, and works quite well. It also has tension and gap adjustments with locknuts and rear-mounted contacts for a distinctive feel during use. Camelbacks, as you may know, are special collectibles among hand-key enthusiasts. These keys are available from Morse Express, 10691 E. Bethany Drive, Suite 800, Aurora, CO 80014; order line 1-800-238-8205 or via <www.morseX.com>.

The unusual looking paddle (yes, it is an iambic paddle) shown in photo 4 also sports an interesting twist: It has round fingerpieces and twin levers set at 45-degree angles. As a result, it responds to vertical, horizontal, or angled finger movements for smooth operation while standing, sitting, or squeezed into some exceptionally uncomfortable position so common in portable operation. The paddle's levers pivot from the rear, travel on each is independently adjustable, and the little paddle handles great. It is made by Englmar Wenk, DK1WE, in Germany. I am serving as his North American liaison, so keys are available from me, Dave Ingram, K4TWJ, 4941 Scenic View Drive, Birmingham, AL 35210; e-mail: <k4twj@cq-amateur-radio.com>.

Killer Mic!

Now shifting to voice-mode treats, your attention is directed to the new Handi-Mic from Heil Sound shown in photo 5 (just when we thought Bob could not improve on perfection, he does it again!). This mini mic is available "your way" with an HC-4 DX element, HC-5 full-range element, high-performance "IC" element for ICOM rigs, "baby Goldline" element, or new extended-range broadcast element for professional use. It is fitted with a flush-mount PTT button and complemented with an optional flex cable that doesn't pull your rig off the desk when stretched.

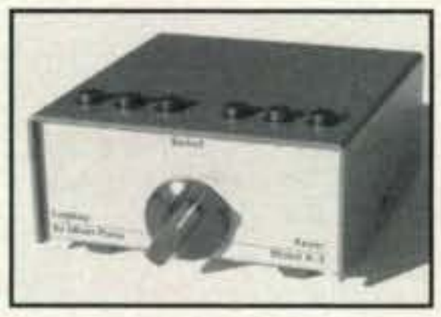
Heil's new Handi-Mic is especially designed to replace those outdated and flat-sounding "clamshell" hand mics some folks use when operating mobile or portable, and it fills that bill in high style. Quite frankly, I was absolutely blown away the first time I heard W5GI using one with an ICOM IC-706. I never thought an IC-706 could sound that

Photo 5– Heil Sound's new Handi-Mic is only half the size of a Goldline and breathes new life into almost any modern transceiver with some of the best-sounding audio on the air today. The mic is available with your choice of wide-range, narrow-range, broadcast-grade or dedicated ICOM element as discussed in the text. Check <www.heilsound.com> for more details.

Serious Products for Serious Hams

SCAF-1 Audio Filter

Make your receiver listener friendly! Variable cut-off audio low-pass filter, 96 db rolloff per octave! Cut-off range frequency 450 Hertz to 3.5 kHz. Absolutely real time, NO delay—perfect for QRQ CW and no monitor problems. Use for CW, Digital modes, and SSB, with headphones or speakers. Super-simple operation, yet wonderfully effective. Sample audio files on our web site. Available as a kit or preassembled.



Keyers: Logikey K3, Super CMOS-3, CMOS-4

Our keyers simply are the best keyers available — Period. More user friendly by far, more features. Extremely powerful memory functions, yet easy to learn. Extended paddle input timing reduces errors and increases your speed. Can emulate many earlier designs for timing feel, but with full feature set. Use with both positive and negative keyed rigs. Built-in monitor included. Full beacon capability.

For full details see our web site. Forget that built-in keyer in your transceiver. You deserve far better. We have one waiting for you.

Antenna Rotor Enhancements:

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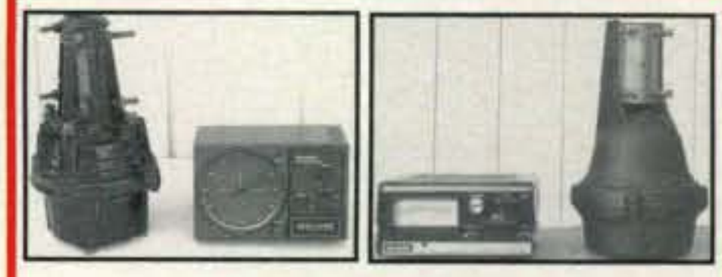
Do you own one of these fine rotors? Bring it into the 21st Century! Rotor-EZ adds a unique "Auto-Point" capability plus brake delay, end-point protection, optional complete computer-control capability for logging and contesting programs, and more!

See our web site for full details of this "must have" enhancement.



Yaesu DXA and SDX series rotors

add affordable plug-in computer-control capability for far less. See our web site for full details!

www.idiompress.com

P.O. Box 1985
Grants Pass, OR 97528

Photo 6– Two special holiday treats in one photo. The item on the left is my Super Mite transmitter kit you build for 40-, 30-, or 20-meter operation. The item on the right is the Grundig FR-200 portable AM/FM/shortwave receiver with four-way power system for emergency preparedness. Placed near one another, the combo works like a mini-transceiver. Alone, the Grundig is great for monitoring international shortwave stations. The Grundig receiver is available from Universal Radio, Inc. (Details in text.)

good—or that only a mic could make such a big difference. Bob Heil really speaks words of wisdom when he says it all starts with the mic! If you would like to know more about the new line of Handi-Mics (or purchase one for a super Christmas gift), check with the fine folks of Heil Sound Ltd., 5800 North Illinois, Fairview Heights, IL 62208; telephone 618-257-3000 or <www.heilsound.com>.

Mini Rig and Radio(s)

Continuing along the "new and unique" path, our spotlight now falls on the Super Mite mini transmitter kit shown (assembled) in photo 6 beside another exciting new gem, the Grundig FR-200 portable shortwave receiver. This easy-brew transmitter debuted in our August 2004 *CQ* "QRP" column. It can be assembled for 40, 30, or 20 meters, and it pumps out 900 milliwatts of genuine DX-grabbing power. It is special because when you place it near an AM-type shortwave receiver (such as the FR-200), it doubles as a wireless and transmitter-tracking BFO for portable work and general band monitoring. How so? First, a VXO circuit in the Super Mite lets you shift its crystal frequency a few kHz like a VFO. Second, a high-value resistor in the keying circuit lets the transmitter continuously radiate a weak .5 milliwatt signal that beats with received signals for copying CW (that's .5 mw key up, 900 mw key down). Most AM receivers exhibit a bandwidth of 6 or 7 kHz, so once set on frequency, receiver tuning tracks with the transmitter. A neat "beach radio" idea, eh?

Super Mite kits are available direct to your house from mine for $19.95 plus $2.50 regular mail, or $3.85 Priority Mail. Order from Dave Ingram, K4TWJ, 4941 Scenic View Drive, Birmingham, AL 35210 and specify if you want a 7.040, 10.108, or 14.060 crystal. Good news: Kits now include PC boards (rather than perfboards) for easy assembly. Also, we understand some folks read their *CQ* magazines several months after they are published and I plan to move in the spring of 2005, so if you read this later, check a current issue of *CQ* for my address before ordering.

The previously mentioned shortwave radio included in photo 6 is a Grundig FR-200 available from Universal Radio, Inc. of Reynoldsburg, Ohio. Grundig, as you may know, is world-famous for its classic Yacht Boy shortwave receivers, such as the popular YB 400 PE shown in photo 7. The FR-200 is less elaborate, but it is perfect for traveling, camping, general SWLing, and emergency preparedness. It operates from three AA cells, an included NiMH battery pack, or an optional AC adapter/charger, and also has a built-in hand-crank dynamo to recharge the NiMH pack when AC is not available. The FR-200 covers the standard AM and FM broadcast bands, plus tunes the full shortwave range from 3.2 to 22 MHz. It is designed to copy international short-

Photo 7– Grundig's incredibly popular YB400PE Yacht Boy AM/FM/shortwave radio is the perfect gift for the average SWL and prospective radio amateur. It tunes in AM, FM, and SSB signals from 144 kHz to 30 MHz and has features galore. Check out <www.universal-radio.com> for more details.

Photo 8– Concerned about middle-of-the-night power failures? Meet the Blackout Buddy, a combination AM/FM clock radio, nightlight, and flashlight. It wakes you on time regardless of power outages and serves as a handy light when staying in unfamiliar places. It is available from Universal Radio, Inc.

wave (AM mode) stations, and it works really great for such a low-cost radio (under $50, including accessories). I found that when it is tuned to 10.1 MHz (or 7.040 MHz if you prefer 40 meters) and placed within a few feet of my Super Mite while using only the FR-200's pull-up whip antenna, it copies CW signals right down to the S5 level. Try one! You'll love it!

The full Grundig line (plus much more and every type/model of amateur radio gear imaginable) is available from the friendly "can do" folks at Universal Radio, Inc., 5830 Americana Parkway, Reynoldsburg, OH 43068; telephone 1-800-431-3939 or <www.universal-radio.com>. Universal also accepts clean gear in trade, and its updated monthly used gear is listed on-line. Check it out!

While highlighting radios for travel, I invite you to also look at the Blackout Buddy AM/FM radio shown in photo 8. This 3" × 5" item is a combination nightlight, flashlight, and clock radio with built-in rechargeable battery pack. You just plug it into a convenient AC outlet and it ensures you wake up on time regardless of power outages. You can even set it to start playing right when the power goes off. Handy! Blackout Buddies are also available from Universal Radio, Inc. As I said earlier, these folks have it all!

Crystal Radio Kit

Have you noticed how building crystal sets—those "free play" radios we home-assembled as youngsters—has once

MFJ *Pocket size* Morse Code Reader™

Hold near your receiver -- it instantly displays CW in English!

Automatic Speed Tracking . . . Instant Replay . . . 32 Character LCD . . . High-Performance Modem . . . Computer Interface . . . Battery Saver . . .

Is your CW rusty? MFJ-461 **$79.95**

Relax and place this tiny pocket size MFJ Morse Code Reader near your receiver's speaker . . .

Then watch CW turn into solid text messages as they scroll across an easy-to-read LCD display.

No cables to hook-up, no computer, no interface, nothing else needed!

Use it as a backup in case you mis-copy a few characters - - it makes working high speed CW a breeze - - even if you're rusty.

Practice by copying along with the MFJ-461. It'll help you learn the code and increase your speed as you instantly see if you're right or wrong.

Eavesdrop on interesting Morse code QSOs from hams all over the world. It's a universal language that's understood the world over.

Automatic Speed Tracking

MFJ *AutoTrak*™ automatically locks on, tracks and displays CW speed up to 99 Words-Per-Minute.

Simply place your MFJ-461 close to your receiver speaker until the lock LED flashes in time with the CW.

Four Display Modes

1. Bottom line scrolls and fills with text, then that entire line is displayed on top line until bottom line refills -- makes reading text extra easy! Automatically displays speed in WPM.

2. Same as **1**, without speed display -- gives you maximum text display.

3. Top line scrolls, bottom line displays speed in Words-Per-Minute.

4. Both top and bottom lines scroll.

Two-line LCD display has 32 large 1/4 inch high-contrast characters.

MFJ Instant Replay

The last 140 characters can be instantly replayed. This lets you re-read or check your copy if you're copying along side the MFJ-461.

High Performance Modem

Consistently get solid copy from MFJ's high performance *PLL* (*phase-lock loop*) modem. Digs out weak signals. Even tracks slightly drifting signals.

Of course, nothing can clean up and copy a sloppy fist, especially weak signals with lots of QRM/QRN.

Computer Interface

The MFJ-461's serial port lets you display CW text full screen on a bright computer monitor -- just use your computer serial port and terminal program.

More Features

When it's too noisy for its microphone pickup, you can connect the MFJ-461 to your receiver with a cable.

Battery saving feature puts MFJ-461 to sleep during periods of inactivity. It wakes up and decodes when it hears CW.

Uses 9 Volt battery (not included).

True Pocket Size

Fits in your shirt pocket with room to spare - smaller than a pack of cigarettes. Tiny 2¼x3¼x1 in. 5½ ounces.

No Instruction Manual needed!

Super easy-to-use! Just turn it on -- it starts copying instantly!

Accessories

MFJ-26B, $4.95. Soft leather protective pouch. Clear plastic overlay for display, push button opening, strong, pocket/belt clip secures MFJ-461.

MFJ-5161, $14.95. MFJ-461 to computer serial port cable (DB-9).

MFJ-5162, $5.95. Receiver cable connects MFJ-461 to your radio's external speaker 3.5 mm jack.

MFJ *Pocket* Morse Tutor

MFJ-418 **$79.95**

Learn Morse code anywhere with this tiny *MFJ Pocket-sized Morse Code Tutor*™! Practice copying letters, numbers, prosigns, punctuations or any combination or words or QSOs. Follows ARRL/VEC format. Start at zero code speed and end up as a high speed *CW Pro!* LCD, built-in speaker.

MFJ Code Oscillator

MFJ-557 **$29.95**

MFJ-557 Deluxe Code Practice Oscillator has a Morse key and oscillator unit mounted together on a heavy steel base -- stays put on your table! Portable. 9-Volt battery or 110 VAC with MFJ-1312, $14.95. Earphone jack, tone and volume controls, speaker. Adjustable key. Sturdy. 8½x2¼x3¾ in.

MFJ *Pocket* CW Keyer

MFJ-403P **$69.95**

Built-in Iambic Paddle. Thumbwheel speed control. Adjustable weight. Adjustable sidetone with speaker. Iambic modes A or B. Fully automatic or semi-auto "bug" mode. Reversable paddle. Tune mode. RF-proof. Battery Saver. Tiny 2¼x3¼x1 in.

MFJ *miniature* Travel Iambic Paddle

MFJ-561, $19.95. 1¾Wx1¾Dx¾H in. *Formed* phosphorous bronze spring paddle, stainless steel base. 4 ft. cord, 3.5 mm plug.

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and Nearest Dealer . . . 800-647-1800

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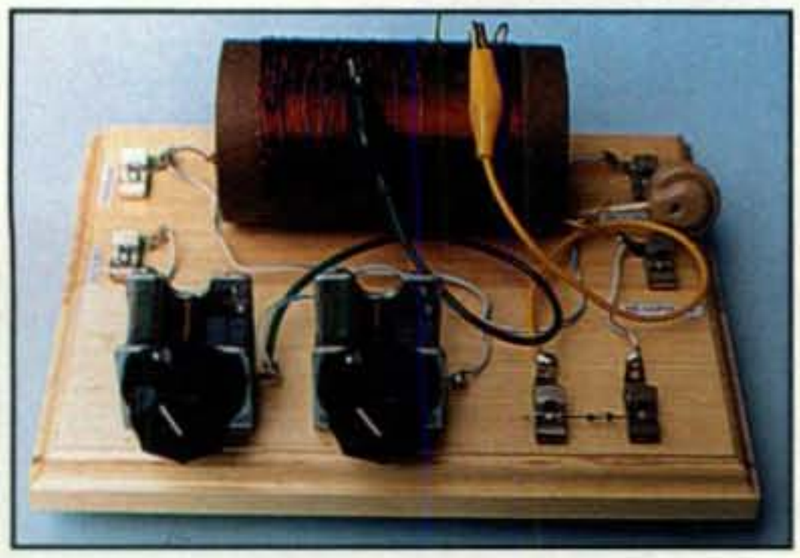


Photo 9– The Dunwoody crystal-radio kit from Bordon Radio Company, named in honor of General H.C. Dunwoody, the inventor of the carborundum crystal radio in 1906. The radio tunes the AM broadcast band and shortwaves to approximately 12 MHz, and it is elaborate, with two air-variable capacitors plus multi-tap coil. (Details at <www.xtalman.com>.)

Photo 10– What's the best way to stay abreast of the latest on-the-air activities, news, and happenings in both amateur radio and shortwave radio? With subscriptions to CQ, Popular Communications, *and* CQ VHF, *naturally. Grab your charge card and telephone 1-800-853-9797 or go to <www.cq-amateur-radio.com> to get your copies!*

again risen in popularity? It's true, and crystal sets are also good, fun projects for bridging the generation gap, especially during the quieter moments of the holidays.

An ideal crystal set to fill that need is the fancy little double-tuned Dunwoody kit available from the Bordon Radio Company (photo 9). The kit is complete with pre-punched wood base, dual tuning capacitors, knobs, Fahnestock clips, and all the trimmings. The coil (which you wind with supplied wire) has multiple turns and multiple taps, and that's where newcomers benefit from old-pro guidance in assembly. It is a grand quick-brew project for all, and it is available from Lance Bordon, WB5REX, of Bordon Radio Company, 13911 Kensington Place, Houston, TX 77034, or <www.xtalman.com>.

Good Reads Wrap-Up

We conclude this year's views with some always appreciated magazines and books to enhance your amateur radio life during the good times ahead (photos 10 and 11). First is a year's subscription (or renewal) to *CQ* and/or sister publications *Popular Communications* and *CQ VHF*. They are akin to a monthly hamfest by mail, and you can order them by telephoning 1-800-853-9797 or going to <www.cq-amateur-radio.com>.

Oops!

6L6 Correction & Modification

Two drafting errors crept into the 6L6 Resurrection article in "World of Ideas" on pages 54–57 of October 2004 *CQ*. Since we need to correct those errors anyway, we're also making a couple of modifications (explained below) that will make this project more "builder-friendly," particularly for those who don't have much experience working with vacuum tubes and high voltages.

First, the corrections:

1. The 6L6 filament pins are 2 and 7.

2. There is a missing dot—indicating connection of the ground buss line, between the "bottom" of the 365 pF capacitor, 2.5 mH choke, 2–0.01 µF capacitors, and one "side" of the key line. (See revised schematic for details.)

Now the modifications:

1. We've added a "double transformer setup" on the power-supply line and a reed relay to the keying line for added safety.

The second transformer (T2) isolates the "ground side" of the circuit from the AC line to minimize the shock potential resulting from touching the ground buss line and an earth ground. This DOES NOT eliminate all shock potentials, as high voltage (300 V) is still present in circuit during operation. The demand of supplying both filament and plate circuits requires that T2 have a rating of 6.3V@3A (Mouser 41FD030). Mouser info: <www.mouser.com> or 1-800-346-6873.

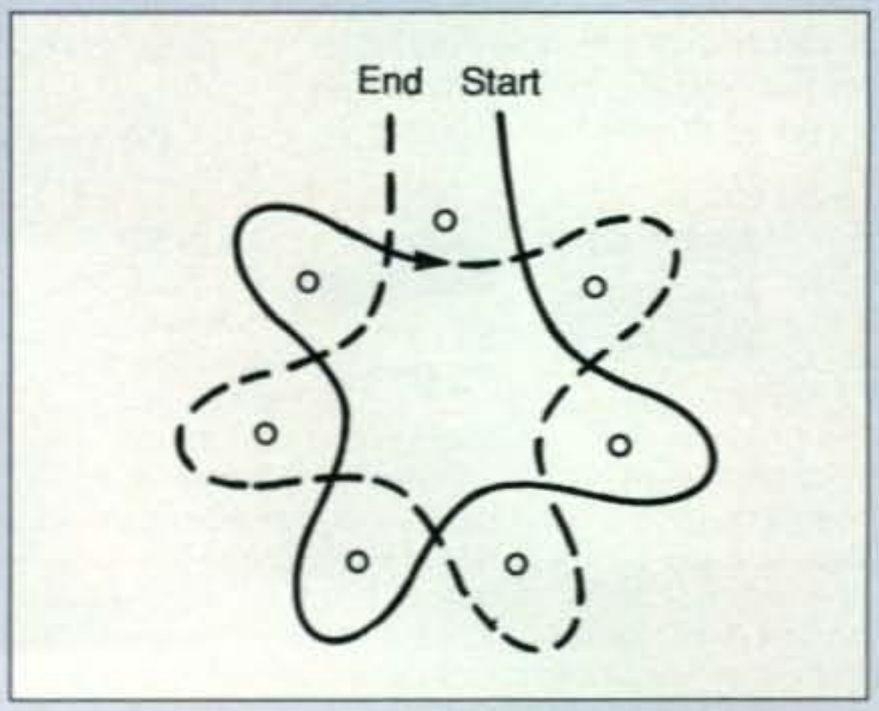
Adding reed relay K1 to the keying line removes high voltage and the possibility of getting shocked from the key. After the mod is made, the voltage across key is 5 V. Reed relays may be obtained from RadioShack, Ocean State Electronics (item nr RY5-500), or Mouser Electronics (item nr 528-171-2).

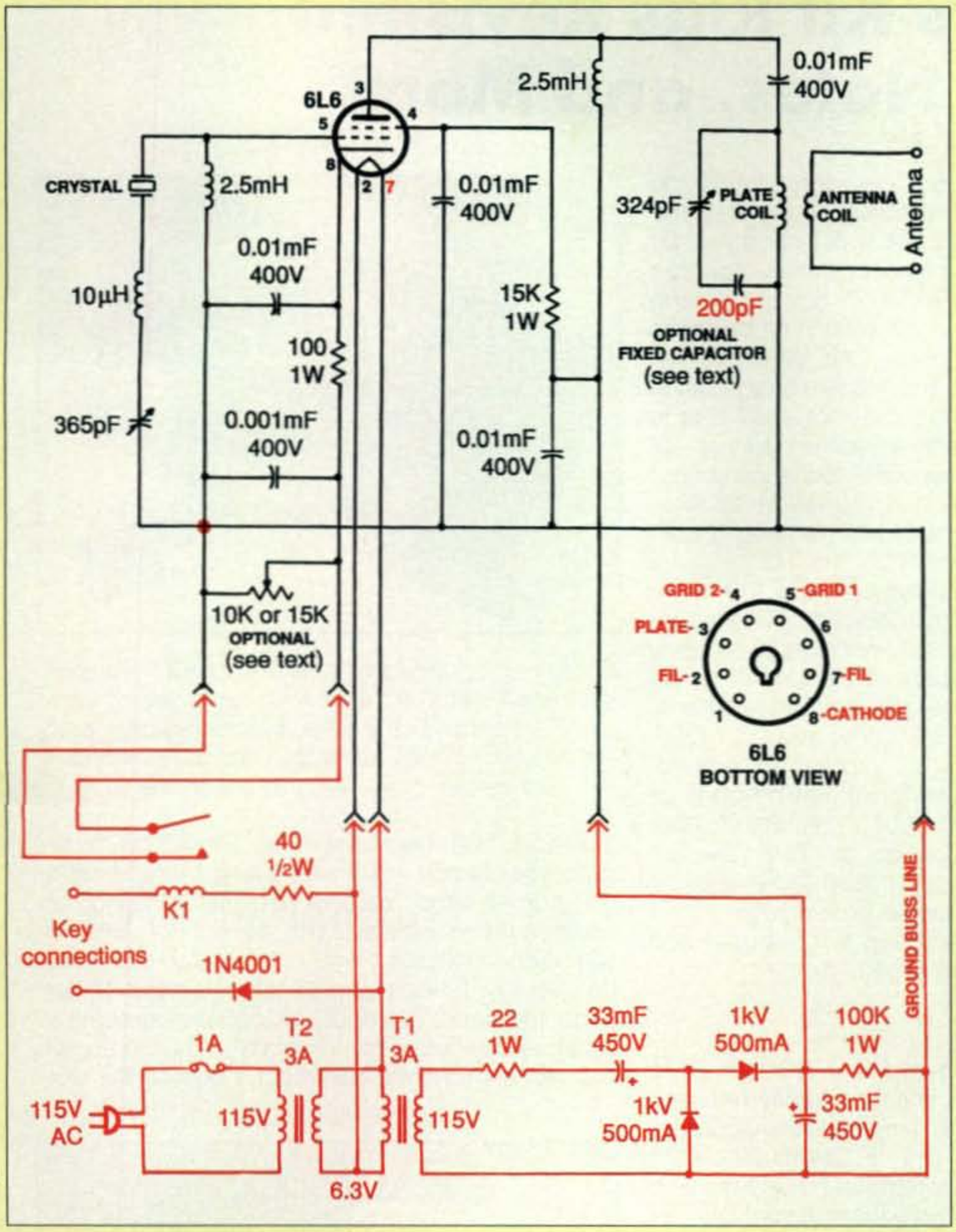
2. Using a 60 pF or 100 pF fixed capacitor in series with the 324 pF variable capacitor across the plate coil (if capacitance is too high) may pull it down too far. We are instead recommending that you start with a 200 pF fixed capacitor if you need one.

3. We're also adding a bit of emphasis to our original advice: If you're new to working with tubes and high voltages, DO NOT build or test this transmitter alone. Seek out the guidance/assistance of an "old pro" familiar with vacuum-tube circuits. Real vacuum-tube rigs are super fun, but they can also be dangerous to amateurs who have only worked with solid-state gear.

Clarification on Figure 3

In the same article, figure 3—showing how to weave the coil for the transmitter—should have shown the nails **equally spaced** around the 2-inch circle, as explained in the text. A corrected view is shown here.





Magic Tuning Wand—Take 2

Dave's original column included a description of a "Magic Tuning Wand," but we magically made the photo of it disappear. Here is the explanation again, with the photo this time:

Bargraphs, LCD panels, and analog meters are good tuning aids, but nothing beats the genuine old-time glitz and glamour of tuning a transmitter by the (RF-ionized) light from a fluorescent lamp. Here a 4-watt, 4-inch long fluorescent tube obtained at Wal-Mart is simply placed beside the plate coil, and the tuning capacitor is adjusted for maximum brightness at keydown. The fluorescent lamp does not reduce output or increase SWR, since it is not connected to the antenna line. It can be left in place during QSOs, and in a dimly-lit room it produces a cool light show reflecting off the tube, coil, and wall.

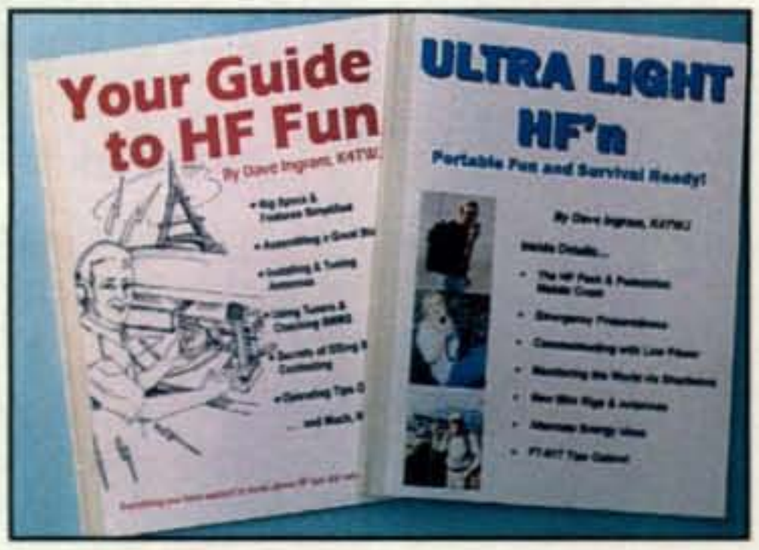


Photo 11–Two good reads guaranteed to expand your amateur radio knowledge and fun are my own Guide to HF Fun *(a helping Elmer in printed form) and* Ultra Light HF'n *(full details on the pedestrian-mobile craze, new mini-rigs, and more). Books are available direct to your house from K4TWJ. (Details in text.)*

Second is your choice of my new *Guide to HF Fun* or *Ultra Light HF'n* book available direct to you from me (Dave Ingram, K4TWJ, 4941 Scenic View Drive, Birmingham, AL 35210) for $16 plus $2.50 book rate or $3.85 Priority Mail.

Enjoy the holidays, and here's hoping we meet on 30 meters one weeknight or on 20 meters SSB one weekend soon. 73, Dave, K4TWJ

YAESU
FT-857D

The Yaesu FT-857D is the world's smallest HF/VHF/UHF multimode amateur transceiver covering 160 m to 70 cm with 100W on HF. Now with 60 meters and DSP2 built-in.

FT-897D

The FT-897D is a multi-mode high-power base/mobile transceiver covering 160 m to 70 cm including 60 meters. Now with TCXO.
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qrp

BY DAVE INGRAM,* K4TWJ

Elecraft's Kit Rigs Revisited, Battery Notes, and More

Hi Ho and Happy Holidays, dear friends and colleagues of low-power hamming supreme. We hope 2004 was a good year for you, and 2005 is looking even better. You can enjoy plenty of terrific QRP QSOs during the coming weeks and months. An overly enthusiastic viewpoint? Nay! Even during this period of low sunspot activity, QRP is thriving like crazy. Doing more with less is definitely the "in trend." Like to check out some of the special action? Join one of the informal and short-run QRP contests scheduled for early December and you will be hooked. Both are sponsored by the QRP Amateur Radio Club International (QRP ARCI).

First there is the Top Band Sprint, a 160-meter event that runs from 0000 to 0600 UTC on December 2. Second is the Holiday Spirits Homebrew Sprint, a CW-only affair that runs from 2000 to 2400 UTC on December 5. The QSO exchange for both contests is the usual RST, state, and your QRP ARCI member number, or if you are not a member, your rig's output power level. The hot spots of action are 1.810, 3.560, 7.040, 14.060, 21.060, and 28.060 MHz. Logs go to Tom Owens, WB5KHC, contest manager, and more specific details are available at <www.qrparci.org>.

Now let's move forward and discuss gear and goodies to get you going in high style!

Photo 1– Elecraft's coat-pocket-size KX1 is an outstanding 4-watt CW transceiver contained on a single PC board. The unit is microprocessor controlled and includes numerous operating features, yet is surprisingly easy to assemble.

Elecraft's Kit Rigs

As a helpful aid for bringing new QRPers up to speed, our recent QRP columns briefly revisited several of today's popular low-power transceivers, such as the Yaesu FT-817, ICOM IC-703, MFJ Cub, and Oak Hills monobanders. This time let's spotlight that well-known producer of cool QRP kit rigs, Elecraft.

You may have heard Elecraft transceivers on the air, seen Elecraft's booth and goodies at hamfests, and noticed that Elecraft owners are quite enthusiastic about using their own self-assembled transceivers. Their pride is well founded, as Elecrafts are loaded with big-rig features yet are surprisingly easy to home-assemble. You just install all parts—including connectors, potentiometers, switches, and even the main tuning/rotary encoder and the frequency display—directly on the PC board(s), mount the board(s) in the case/enclosure, and perform a simple alignment. There is no off-board wiring, which has proven to be the most time-consuming and error-prone aspect of building kits. Nice!

If you are new to kit building, the KX1 shown in photo 1 is an ideal "first project" transceiver. It is a QSL-card-size rig, measuring 1.2"H × 5.3"W × 3"D and works 40 and 20 meters with up to 4 watts output; a small optional board you wire to the main board adds 30-meter operation. The KX1 is microprocessor based with three tuning rates, extended (out of band) receive for mild SWLing, an adjustable crystal filter (2.0 to .5 kHz), RIT, full QSK with diode switching, and a three-digit multifunction display. It also has a switch-selectable Morse code frequency readout, an optional automatic tuner, and a holder for internally installing six AA cells for stand-alone operation. I built a KX1 dur-

Photo 2– The Elecraft K1 is a remarkably small four-band CW transceiver that is loaded with features, light on battery drain, and a great traveling companion. Here, the top cover is removed to show how all components mount directly on PC boards that plug into one another and also mate with the front panel for easy assembly. The rig runs 5 watts output, and eight AA cells can be installed internally for stand-alone operation. (Photo courtesy Elecraft)

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Photo 3– Elecraft's top-of-the-line K2 sports all the operating features and functions of a deluxe 100-watt transceiver (and a 100-watt output RF module is also available as an option). Thanks to modularized on-board installation of all components, assembly is fairly easy. (Discussion in text.)

ing my spare time in a three- to four-day period and use it at home, while portable, and even mobile with good results. It is an outstanding grab-and-go rig that runs for hours on a handful of AA cells.

Next up is the sharp-looking, smooth-operating K1 CW transceiver shown in photo 2. This "step up" from the KX1 measures 2.2"H×5.2"W×5.6"D and can be assembled as a two-band or four-band unit covering 40, 30, 20, and either 17 or 15 meters with up to 5 watts output. The K1 includes full band coverage plus extended receive, three crystal-filter bandwidths, RIT, XIT, full CW break-in, S-meter, keyer with memories, internal speaker, and a battery holder for eight AA cells. An internal automatic tuner is also available, and the K1 is especially suited for portable operation with low-current-drain circuitry (55 ma on receive, typical). The K1 is slightly more complex than the KX1, so expect assembly time to be a bit longer. Still, it goes together without entanglements, and alignment requires only a good VOM, SWR/wattmeter, and well-calibrated receiver or ham transceiver.

Completing Elecraft's (present) transceiver line is the fancy K2 shown in photo 3. This 2.9"H × 7.8"W × 8.2"D delight covers 80 through 10 meters CW (SSB and 160-meter coverage are

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Photo 4– Recently, battery technology has expanded quite noticeably, and major-brand alkaline types are now real powerhouses. The popular Energizer Max AA cell is rated at 2850 mah, E2 titaniums are 3135 mah, and Eveready alkalines or Energizer Max 9-volt batteries are 625 mah. Off-brand and/or economy special cells and batteries are usually carbon-zinc types of unknown ratings. (Discussion in text.)

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available with an optional PC board) with up to 15 watts output standard, 100 watts output optional. In fact, a large number of options are available for customizing a K2 to your own preference and needs: noise blanker, automatic antenna tuner, DSP system, etc. The K2 also has dual VFOs, RIT, XIT, keyer with memories, RF preamp, full QSK, multiple tune rates, and, well, everything you typically find in a modern, commercially made HF transceiver. It is a killer!

The K2 obviously is a more advanced kit and more suited to old pros than new builders. It takes time to assemble, but its instruction manual is well detailed to help ensure success. I would describe it as a modern equivalent of the famous Heathkits of the past, but by comparison it seems more complex, yet thanks to no off-board wiring, easier to assemble.

Recently Elecraft also introduced some interesting and quite versatile mini-kits worthy of recognition. Space is too tight to include them in this month's column, however, so we will feature them next time. Stay with us. Meanwhile, more details (and rigs!) are available direct from Elecraft at P.O. Box 69, Aptos, CA 95001; telephone 831-662-8345 or via <www.elecraft.com>.

Battery Talk

Operating portable with small battery-powered gear has always been one of QRP's big attractions, and the pursuit also drives us to continuously seek the best battery to fill our particular needs. In light of that fact, I recently investigated current ratings on some of today's best-known cells and batteries (photo 4), and I uncovered some very interesting facts in the process.

Starting with 1.5-volt AA cells, the popular Energizer Max is rated at a whopping 2850 milliamphours (yes, I too questioned that figure, but Energizer double checked and confirmed it—2850 mah, or 2.8 amps. Wow!). Energizer's new E2 Titanium AA cells, those cells with the shiny silver wrappers, are rated at 3135 mah. That is even more than the Max, but E2 cells are also pricey little things because their main attraction is long shelf life. When you are considering long-run emergency preparedness, E2 cells are a very good choice. As a familiar point of reference here, incidentally, most of today's nickel metal hydride (NiMH) cells are rated between 1450 and 1850 mah. W4RT.com recently "pushed that envelope" with the introduction of 2350 mah AA NiMH cells in its custom battery packs for the FT-817.

Looking at 9-volt batteries, the Energizer Max is rated at 625 mah, which really blows away those 100-mah "bargain batteries" of the past. Even Eveready's "Super Heavy-Duty" carbon zinc 9-volt batteries (the black-case items) are now rated at 400 mah, Eveready 9-volt alkalines (the red-case batteries) are 625 mah, and Eveready AA alkalines are 2850 mah. Surprised? Well, Energizer and Eveready are the same company. Heavy competition, eh? Oh yes: Those special (and expensive) 9-volt lithiums are rated at 1200 mah, and the trim little AAA Energizer Max cells are rated at 1250 mah, which is double the rating of older AA alkalines. What's next? Dilithium crystals?

How do the previously mentioned figures relate to transceiver operating time? To answer that question, let's use Elecraft's KX1 as an example, and then you can apply the facts to your own rig.

The KX1 draws 35 ma on receive, so on-and-off receiving for a total time of 10 hours uses 350 mah (10 × 35 ma). Assuming use of Energizer Max cells,

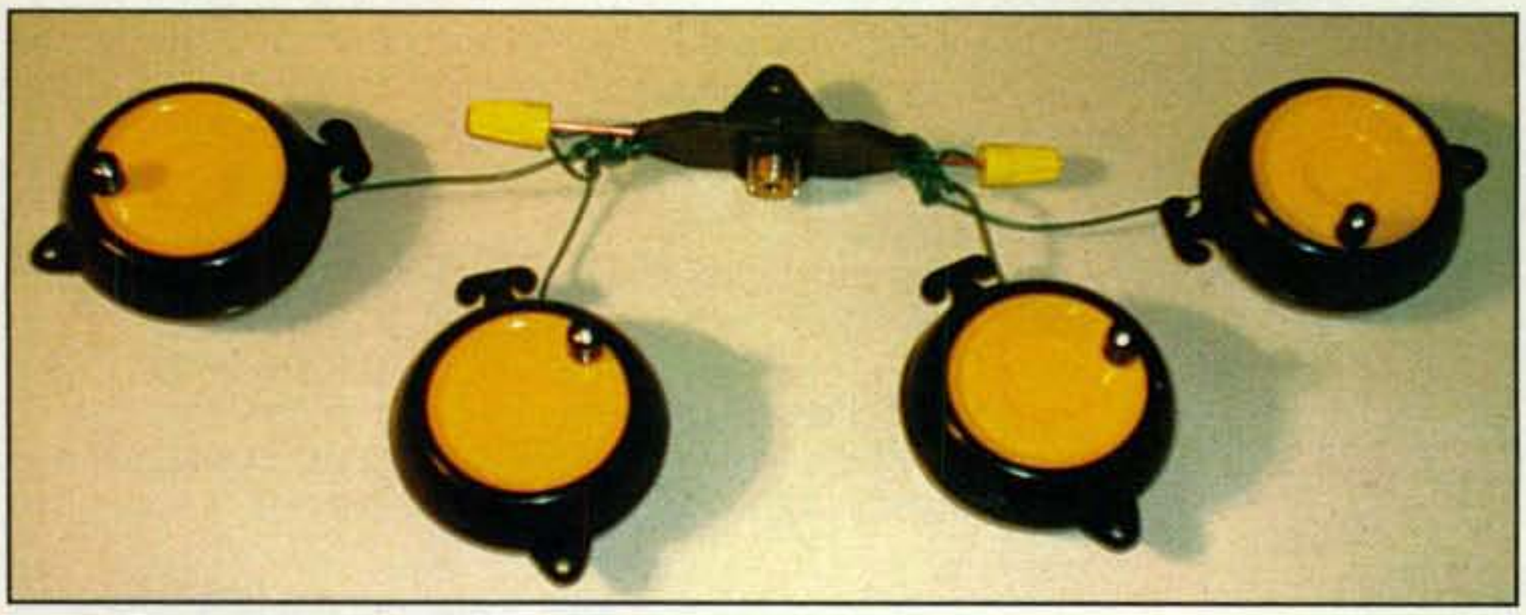

Photo 5– DWM Communications' well-known YoYo Tenna now has been expanded into a fan dipole with four or six windup reels so you can operate two or three bands at one time. It is compact and easy to carry, and easy to prune for lowest SWR. (Details in text.)

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2850 – 350 leaves 2500 mah. The KX1 draws 700 ma on transmit, so 2500/700 = 3.57 hours total transmit time. Combined, that's 10.57 hours total transmit and receive time, and at 2 hours of operating time a day, that's 5 days.

Let's do the math again, but use Yaesu's FT-817 (with more Energizer Max batteries) as the example. The FT-817 draws 450 ma on receive, so 3 hours of receiving will use 1350 mah. Assuming Max cells, 2850 – 1350 = 1500 mah left. The FT-817 draws 2000 ma on transmit, so 1500/2000 = .75 hour, or 45 minutes. That equates to a total operating time of 3 hours and 45 minutes. Thus, the bottom line is to combine high-current cells with energy-efficient gear to reap the longest possible operating time. Simple enough?

New Goodies from DWM

Seasoned QRPers surely will recognize the names DWM Communications, YoYo Tennas, and Peanut Whistle II mini-transmitters for portable operating stints and lighthearted hamming. Recently, DWM owner Bill Lauterbach, WA8MEA, made a few upgrades to the line and shared some of the details with us for inclusion in this column.

First are the new double- and triple-fan YoYo Vee dipoles such as the double version shown in photo 5. If you are not familiar with the original YoYo dipole (which is still available), it consists of two wind-up reels and a center insulator with SO-239 connector. Each reel is loaded with approximately 45 feet of insulated copper wire, so you just pull it from the YoYo reel, lock it at a desired band-length (such as 33 feet per side for 40 meters, 23.1 feet for 30 meters, 16.5 feet for 20 meters, etc.), and then rewind it back into the reel after use or to change bands. The new versions have four or six wind-up reels to make a two- or three-band dipole with one feedline. Assuming you pre-mark the wires, you can even reset it to change bands for weekend fun. Just remember the (1/4 wave) formula of 234/Freq. (in MHz) = length of each dipole side, take along some RG-58 or RG-8X plus a couple of pull-up ropes with weights, and you can be on the air from almost anywhere with a multiband YoYo Tenna.

Photo 6– The trail-ready QRP setup of Buzz, AC7RG, consists of a DWM Peanut Whistle II transmitter, key, battery pack, shortwave receiver, and YoYo Tenna packed in a rugged mini-footlocker. This thing should definitely survive any type of abuse!

Another popular DWM item, the Peanut Whistle II 2-watt 40 meter transmitter, also has been revamped with on-board Fahnestock clips for quickly connecting a key, battery, and antenna. DWM now has 7.040-MHz crystals available for the Peanut Whistle II. More details, plus YoYo Tennas and PWII transmitters, are available from DWM Communications, P.O. Box 87, Hanover, MI 49241; phone 1-517-563-2613, e-mail: <tinytenna@hotmail.com>.

One of the most interesting setups built around a Peanut Whistle II we have seen, incidentally, is shown in photo 6. Buzz, AC7RG, mounted it plus a key and knife switch in the top of a small chest for carrying along on motorcycle trips and camp-outs. Batteries for the PWII and a portable shortwave receiver store in the chest's lower area. Clever!

That overflows available space and once again brings us to the closing wire. Thanks to everyone for your continuing kind words and support, keep on working the world with QRP, and here's hoping we meet on 30 meters one weeknight soon.

73, Dave, K4TWJ

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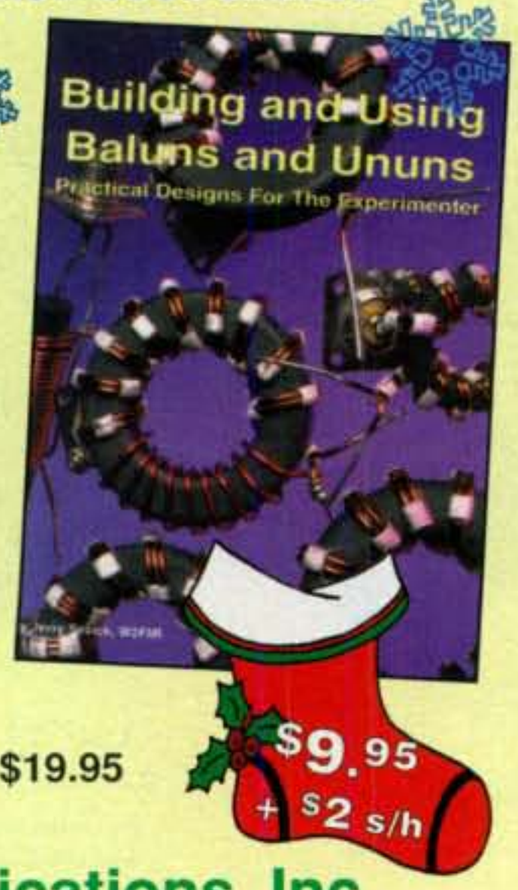

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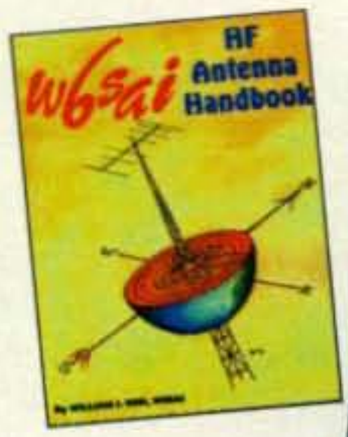

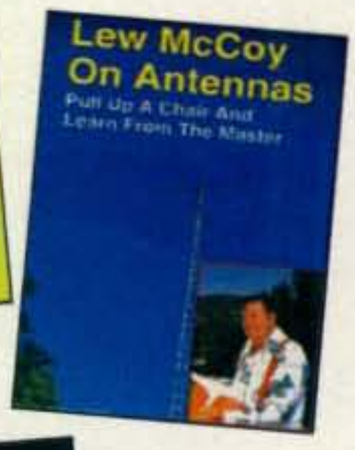

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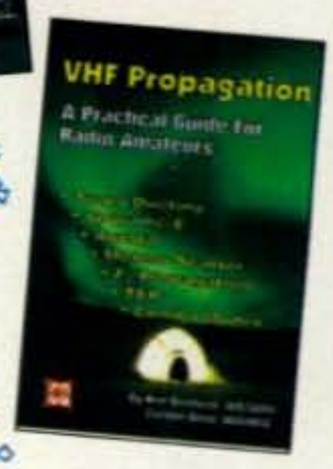

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BY JOE LYNCH,* N6CL

BPL: An Early Holiday Present for the Industry?

Has the BPL (broadband over power lines) industry received an early holiday present from the FCC, or is BPL dead? This may be a valid question to ask in the aftermath of the FCC's October 14, 2004 decision to approve regulations for BPL internet service. While those players in the industry essentially got the regulations they wanted, we amateurs got recognition that BPL does have the potential for interference to our service as well as others who use the HF and low VHF spectrum.

In the Report and Order, which is scheduled to be released any day now, the FCC has set aside certain frequency spectrums for public safety that will have to be notched out of any BPL systems. In addition, the FCC has required that a data base, which will be keyed to zip codes, be established which will include information of BPL operations and a name and phone number of a contact person. Even so, as ARRL President Jim Haynie, W5JBP, concedes, "The devil is in the details of the R & O."

How will this new regulation really affect the high-speed internet business? Insofar as BPL is concerned, a large-scale rollout of BPL service in any market is most likely several months away, mainly because technical standards have to be established and equipment has to be developed that will be in compliance with these new technical standards.

With regard to the technical standards, there is the issue of the hardware standards. In developing the latter, the IEEE has established working group IEEE 1675, which will address the Standard for Broadband over Powerline Hardware. According to the Projects Authorization Request (PAR), "The scope of this standard will be to provide Utilities and Manufacturers standards for the commonly used hardware for BPL installations, and provide standard installation, maintenance and operation methods to ensure the safety of both Utility and Non-utility personnel working on BPL equipment. This project will not cover data transmission, protocols, or other aspects of BPL related to the internal workings of this technology." (See the following URL for more details related to this PAR: <http://grouper.ieee.org/groups/bop/BPL%20PAR.doc>.)

Regarding the wireless side of BPL, another IEEE working group that is in its early stages of development, IEEE 802.22, which will be the standard for fixed wireless systems that use cognitive radio techniques, got underway last fall. The purpose of this working group is to develop the standards used by wireless devices that will use the unused TV spectrum between 54 and 862 MHz. Why is this seemingly under-the-radar development important? The question has to do with how BPL technology will reach the final mile for these rural markets. The answer has to do with WiMAX. By combining the BPL technology with a marriage of WiMAX, the ISP is able to reach these rural customers without the necessity of using dozens of repeaters installed on the power lines along the way. (Ssee the following URL for more information related to this and other 802 standards working groups: <http://www.ieee802.org>.)

WiMAX has been touted as the next generation of really high-speed internet service. In an October 14, 2002 article entitled "Silicon Insider: WiMAX Communications" (which appears on the ABC News Business website, starting at the following URL: <http://abcnews.go.com/Business/SiliconInsider/story?id=88655&page=1>) Michael S. Malone touts the benefits of WiMAX as the solution for the last mile—and more—writing, "WiMax, with its low incremental costs (its wide range means it is cheap to add additional users) skips nearly all of that in-between hardware: an entire city can be covered from a single location."

Citing Patrick Gelsinger, chief technologist for Intel, who gave a speech in Bangalore, India, in which he suggested that WiMax may well be the way for countries like India to bridge the so-called "Digital Divide," Malone quotes from that speech: "The appeal to emerging markets is striking to say the least," Gelsinger said. "Imagine being able to put up an antenna and provide high-speed internet to thousands of customers who have little access to the internet or even wired phones today. That has great promise in countries like India where the cost of wiring the countries would make broadband internet access far too expensive."

Even so, for the U.S. market, Malone points out that there are problems with the frequency spectrum where WiMAX works best, writing, "There are some real problems with getting WiMax adopted. For example, those parts of the broadcast spectrum where WiMax works best are owned by a small number of vendors, notably Nextel. And Nextel, to date, seems more interested in using those frequencies for other applications."

Here is where the emerging IEEE 802.22 working group becomes important. One of the principal players in WiMAX is Intel. Malone spends a lot of editorial commenting on how deeply involved Intel has become in developing hardware compatible with WiMAX, at one point writing, "In fact, Intel has embarked on a major initiative into communications

VHF Plus Calendar

Dec. 4–5	Third weekend of the ARRL EME contest (See text for details)
Dec. 5	Last Quarter Moon. Moderate EME conditions
Dec. 12	Moon Perigee and New Moon. Very Poor EME conditions.
Dec. 13	*Geminids* Meteor Shower Peak
Dec. 18	First Quarter Moon
Dec. 19	Moderate EME conditions
Dec. 21	Winter Solstice
Dec. 22	*Ursids* Meteor Shower Peak
Dec. 26	Full Moon. Very Poor EME conditions.
Dec. 27	Moon Apogee.

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that will redefine the company over the next decade. And at the heart of that initiative is WiMax, the capability for which you are likely to see in every Xeon, Centrino and Pentium chip Intel makes within a two years."

Even so, without the frequency spectrum from which to operate, they have nowhere to go with their product. The answer to this problem may be found in IEEE 802.22. In an October 14, 2004 article entitled "IEEE tunes into spectrum possibilities for wireless" (posted on the Vnunet.com website at <http://www.vnunet.com/news/1158744>) authors Robert Jaques and Ian Lynch discuss IEEE 802.22 and the ramifications for WiMAX, in particular what benefit Intel will derive from this standard, by writing, "Freeing up this prime area of spectrum has long been a target for Intel, which is developing chips to support 802.16 Wi-Max technology."

What about timelines? In an October 9, 2004 Reuters source article entitled "Ultrawideband: Wireless Whoopee" (which appears on the Wired.com website at <http://www.wired.com/news/technology/0,1282,65297,00.html>) the same author for the ABC News article, Michael S. Malone, comments, "Think of it as Wi-Fi on steroids. On its way to U.S. living rooms and maybe even automobiles is a new type of high-speed wireless connection that promises downloaded data rates of up to 1 gigabit per second—roughly 18.5 times the speed of Wi-Fi—to personal computers and other devices.

"This ultrawideband technology, which could become available in the next two years, also allows the devices to send data upstream to a network at 480 megabits per second."

Also commenting on WiMAX are Sam Diaz and Dean Takahashi of Mercury News. Writing in an article entitled "Taking WiFi to the Max" (see the SiliconValley. com website at the following URL: <http://www.siliconvalley.com/mld/siliconvalley/business/technology/personal_technology/9831069.htm>) they write, "Intel, one of the biggest backers of the technology, has shipped its first WiMax chips to equipment manufacturers. Full-scale deployment of WiMax is expected to begin in 2007. The company is also conducting about 50 WiMax tests around the country to see how equipment from different WiMax suppliers works together and how WiMax service reacts to trees, buildings, and different weather conditions."

WiMAX is not without its detractors, however. In the ABC News article, Malone comments that one of the other problems with WiMAX is in delivering what it promises, writing, "WiMax, at least at the beginning, is also going to suffer the usual failure to deliver what customers will believe it promises. For example, the early generations will only work on fixed platforms, not mobile. But I don't think that will be enough to stop it."

Problems also currently exist in the area coverage claims. While WiMAX claims distances of up to 30 miles, again from the ABC News article, Malone points out that more practically "most installations will average about 5–10 miles." Ron OLexa, KA3JIJ, in last month's *CQ*, also challenges the 30-mile range claimed by WiMAX promoters (*CQ*, November 2004, pp. 20–23).

Intel acknowledges as much in a couple of papers dealing with antenna and RF considerations. In a paper from the August 20, 2004 issue of *Intel Technology Journal* (Volume 08, Issue 03) entitled "Multiple-Antenna Technology in WiMAX Systems," authors A. Salvekar, S. Sandhu, Q. Li, M-H Vuong, and X. Qian discuss some of the technology issues and their solutions (go to the following: <http://developer.intel.com/technology/itj/2004/volume08issue03/art05_multiantenna/p01_abstract.htm> [August 2004]). From their abstract is the following:

"WiMAX is a wireless technology that provides broadband data at rates over 3 bits/second/Hz. In order to increase the range and reliability of WiMAX systems, the IEEE 802.16-2004 standard supports optional multiple-antenna techniques such as Alamouti Space-Time Coding (STC), Adaptive Antenna Systems (AAS) and Multiple-Input Multiple-Output (MIMO) systems. In this paper, we focus on techniques that do

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not require channel knowledge at the transmitter, which include both Alamouti STC and MIMO, but not AAS.

"In the first half of the paper, we present simple diversity schemes that require only a single RF chain at the receiver. The performance of STC is compared with non-STC performance. Simulations show that STC buys 2–10 dB over a single antenna system, which can double the cell range and quadruple the cell coverage. For STC, multiple Radio Frequency (RF) chains are implemented at the Base Station (BS) to shift cost away from Subscriber Stations (SS), thus enabling market penetration for first-generation, high-performance IEEE 802.16-2004 networks. We then concentrate on other simple standard-compliant diversity schemes that require only a single receive chain at the SS: delay diversity and selection diversity.

The second half of the paper investigates standard-compliant MIMO techniques and proposes new non-standard advanced algorithms for open-loop MIMO. A novel space-frequency bit-interleaver that buys 2–4 dB over a frequency-only interleaver is presented. A 2x2 MIMO can double the throughput at a reduced range. An iterative receiver is introduced to recover range, which buys up to 5 dB with additional baseband complexity.

Concerning RF considerations, in the same issue of *Intel Technology Journal* is the article "RF System and Circuit Challenges for WiMAX," in which authors B. Balvinder, R. Eline, and L. Franca-Neto discuss RF considerations for the worldwide deployment of WiMAX (<http://developer.intel.com/technology/itj/2004/volume08issue03/art02_rfsystem/p01_abstract.htm> [August 2004]) . From their abstract is the following:

"Broadband Wireless Access has occupied a niche in the market for about a decade, but with the signing of the 802.16d standard it could finally explode into the mass market. Intel's baseband transceiver chip is flexible enough to accommodate Radio Frequency Integrated Circuit (RFIC) architectures of today and the future. With the emergence of this standard an ecosystem is developing that will allow multiple vendors to produce components that adhere to a standard specification and hence allow large-scale deployment. One of the major challenges of the 802.16d standard is the plethora of options that exist; Worldwide Interoperability Microwave Access (WiMAX) will address this issue by limiting options and hence ensure interoperability. The result will allow manufacturers of Radio Frequency (RF) components and test equipment to have their products used for mass deployment.

In this paper, we focus on the various RF challenges that exist on a RF system-level and show how such challenges can translate into circuit designs. The RF is made more complicated by the fact that WiMAX indeed addresses wireless markets across the world both in licensed and unlicensed bands. Thus, solutions have to be flexible enough to allow for the many RF frequency bands and different regulations around the globe. Several major RF architectures are discussed and the implications for WiMAX specifications are explored, in particular both Intermediate Frequency (IF)- and I/Q-based structures are investigated.

Part of our discussion will provide insight into the cost and performance tradeoffs between Time Division Duplex (TDD) and Frequency Division Duplex (FDD) systems both in licensed and unlicensed bands. It is generally accepted that TDD systems offer cost advantages over their FDD counterparts; however, most licensed bands intended for data applications operate with FDD systems in mind. Some of the RF subsystem blocks that have stringent WiMAX specifications are also elaborated upon: these include synthesizers, power amplifiers, and filtering. These fundamental subsystem blocks are where most of the transceiver costs reside; the same blocks are also responsible for most of the RF performance.

The industry is moving towards using Orthogonal Frequency Division Multiplexing Access (OFDMA) and either spatial diversity or beam forming techniques to enhance link margins. We touch on the RF challenges associated with these techniques. Finally, we view some of the important WiMAX specifications for RF and the implications for the design of RF circuits, which include SNDR, channel bandwidths, RF bands, noise figures, output power levels, and gain setting. Some important differences between WiMAX and 802.11 RF specifications are also highlighted.

For those of us who are interested in the technology, it would be good to look up these articles and wade through them. In particular, the first article, in which multiple antennas are discussed as a solution to multipath problems associated with microwave signal reception, might have applications in our hobby.

Still there are detractors. In the ABC News article, Malone comments concerning Texas Instruments' concerns about WiMAX, writing, "Texas Instruments, a veteran of the communications chip business, has questioned the potential of WiMax, arguing that past broadband standards haven't been successful, and that some key global markets like China have shown little interest in adopting it.

"This sounds like, as website Wi-Fi Networking News called it, 'sour grapes' on TI's part as it helplessly watches tech's 900-pound gorilla come crashing into its back yard. The fact is, as TI certainly knows, if Intel wants WiMax to become a widely used standard, it probably will be."

Indeed, insofar as the China market is concerned, what Intel wants, Intel gets. In an October 4, 2004 *Fortune* magazine article entitled "How Intel Got Inside," author Fred Vogelstein points out that Intel's "hunger for a huge new marketplace has driven it deep into China" (page 127). Having established a Beijing office in 1986, several years before the U.S. lifted its restriction on technology sales to China, Intel has steadily increased its presence ever since. Commenting on its presence today, he states that with more than 3000 workers in two plants, and a one- billion dollar capital investment, Intel has become one of the largest foreign employers, adding, "Indeed, today the Chinese don't know Intel as just the company with that 'Intel Inside' sticker on the ir computers, as consumers do in the U.S.

Paul Wade, W1GHZ, addressed the approximately 130 microwave enthusiasts gathered at the Microwave Update Conference this past October in Irving, Texas. He spoke on the subject of multiple-reflector dishes and feeds. (N6CL photo)

They know it as perhaps the most dominant high-tech brand in the country—a brand associated with progress itself" (page 130).

This China presence is hugely important for WiMAX technology, because, as with India, China is not hardwired for technology. Therefore, WiMAX is a natural for providing the high-speed internet access throughout the country—and Intel, as the chief player in WiMAX, is for all intents and purposes monopolistically poised to take advantage of this business opportunity.

This mention of not being hardwired for technology brings me back to rural America. As with India and China, as mentioned above, rural America is not hardwired for highispeed internet. Considering the huge investment necessary for hardware, BPL will not in and of itself make the market penetration into the rural market. However, as Malone points out in the ABC News article, WiMAX will prove to be considerably less expensive, and the link between BPL and WiMAX will then make the last mile trip to the rural homeowner and farmer and business owner—but, as I point out above, not tomorrow, or any time in the next two years.

Therefore, where does this leave us hams with regard to a BPL rollout? As already implied in this piece, BPL is not going into rural America alone. Barry Malowanchuk, VE4MA, gave talks at this year's Central States VHF Conference in Mississauga, Ontario, Canada, and this year's Microwave Update Conference in Irving, Texas, in which he pointed out the drawbacks of BPL attempting to penetrate the rural markets. In particular, he emphasized that the cost of installing dozens of repeaters would be prohibitive in relation

to what they would be able to charge the subscriber for the service. For more information on Barry's insider insight, please see his article "Broadband Over Power Line (BPL) Interference: Fact or Fiction?" which appears in the Fall 2004 issue of *CQ VHF* magazine.

For the rest of us, will BPL be coming to our neighborhood anytime soon? As I point out above, it will not occur until after the hardware and safety standards have been established for equipment and its installation. In addition, according to the *ARRL Letter,* League President Jim Haynie, W5JBP, points out that one of the items that the League wanted and got in the new FCC regulations was certification of the equipment as opposed to verification. This additional step requires FCC oversight of the equipment development that will be developed for BPL use – which alone will add several more months to the eventual rollout date.

Finally, in consideration that BPL is a latecomer to the urban and suburban broadband market that is already being gobbled up by telephone and cable companies, and perhaps even fiber optics, it is highly unlikely that it will make economic sense for a large-scale rollout in the foreseeable future.

It does not, however, pay for us to let down our guard. If we can measure the future deployment in terms of its history, then BPL will seek to enter marketplaces that are naturally free of hams, such as more modern subdivisions with their built-in antenna covenants and restrictions. Even so, in order to get to these neighborhoods these signals may have to travel on overhead power lines that pass through neighborhoods where hams *do* live. Furthermore, the jury is still out regarding long-range propagation of the signals on the de facto antennas known as power lines. It still will be up to us to be vigilant and proactive should we become threatened by BPL interference.

New World Record Set on 47 GHz

The following is from the ARRL Letter:

On September 19 during the ARRL 10 GHz and Up Cumulative Contest, Frank Bauregger, W6QI, and Gary Lauterbach, AD6FP, claimed a new world distance record on 47 GHz after they completed a contact over a distance of 290 km. W6QI operated from Shuteye Peak (DM07gi) just south of Yosemite, while AD6FP operated from Frazier Mountain (DM04ms—see photo) north of Los Angeles. Although it was officially still summer, W6QI had to brave 30-degree temperatures and snow while modifying the radio in order to complete the contact. Signal margins were 40 dB on the W6QI end and about 8 dB on the AD6FP end. The contact was completed using a combination of narrowband FM and CW. The two reported weather conditions were quite unusual for September with scattered rain showers in the central California Valley between Shuteye and Frazier.

AMSAT and ARISS Meetings

Between October 8–11, 2004, AMSAT and ARISS held meetings related to amateur radio in space, both taking place in Arlington, Virginia. Among the highlights of the AMSAT meeting was the installation of new AMSAT-NA officers and a contact with ISS astronaut Mike Fincke, KE5AIT, aboard the ISS. The new officers are: president, Rick Hambly, W2GPS, executive vice president, Lee McLamb, KU4OS. Also taking office were appointments made by Rick, which include Frank Bauer, KA3HDO, as vice president for human space flight, and Barry Baines, WD4ASW, vice president of marketing and user services. Both of these persons hold new VP positions within AMSAT-NA. Other appointments made by Rick include: Vice President for Operations Mike Kingery, KE4AZN; Vice President for Engineering Stan Wood, WA4FNY; Treasurer Gunther Meise, W8GSM, and AMSAT Manager Martha Saragovitz.

For more information and meeting highlights, go to: <http:// www.amsat.org/amsat-new/symposium/updates>.

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Russia Proposes SuitSAT

One of the more creative proposals that came out of the AMSAT meetings is that of a satellite created from a surplus Russian spacesuit. The following is from AMSAT-NA:

Storage space on the ISS has become an issue and some items will be jettisoned overboard rather than send them down in the Progress supply vehicle. One item to be jettisoned is a Russian Orlon EVA suit, which has a large storage backpack. The Orlon suit is fully functional, but has "expired," meaning that it is no longer trustworthy to support human EVA.

A proposal is being developed by Sergey RV3DR, the Russian ARISS delegate to place an amateur radio repeater and other systems in the Orlon suit. When jettisoned, the suit would become a fully functional satellite. It will also be possible to install a video camera system in the suit helmet that will provide SSTV imagery.

Expected time frame for SuitSat launch is Autumn of 2005.

SERA Rescinds Tone Policy

During its October 4, 2004 board meeting, the SouthEastern Repeater Association rescinded its controversial tone policy that would have required all newly coordinated repeaters under its jurisdiction to have a mandatory tone access and all existing repeaters to eventually also have mandatory tone access by July 1, 2006. According to the *ARRL Letter,*

SERA President Roger Gregory, W4RWG, said the SERA Board repealed the policy "after much discussion" on October 4.

"We may revisit this issue at a later date, but with input from the membership," Gregory told ARRL. He said that while SERA received many positive comments as well as negative ones, complaints from repeater owners prompted the Board's change of heart on the tone policy.

"Some [repeaters] had been untoned for years without any interference issues," he said. "They did not wish to tone. North Carolina, South Carolina and Tennessee seemed to have more concerned repeater owners."

For an insider's perspective on such a mandatory policy, please see Gary Pearce, KN4AQ's "FM" column in the Fall 2004 issue of *CQ VHF* magazine.

Current Meteor Showers

December: Two showers occur this month. The first, the *Geminids,* is predicted to peak around 2220 UTC on 13 December. The actual peak can occur 2.5 hours before or after the predicted peak. It has a broad peak and is a good north-south shower, producing an average of 100–110 meteors per hour at its peak.

The second, the *Ursids,* is predicted to peak on 23 December. It is an east-west shower, producing an average of greater than 12 meteors per hour, with the possibility of upwards of 90 at its peak.

January: The *Quandrantids,* or *Quads,* is a brief, but very active meteor shower. The expected peak is on 3 January. The actual peak can occur three hours before or after the predicted peak. The best paths are north-south. Long-duration meteors can be expected about one hour after the predicted peak.

For more information on the above meteor-shower predictions see Tomas Hood, NW7US's "Propagation" column elsewhere in this issue. Also visit the International Meteor Organization's website: <http://www.imo.net>.

Current Contest

The third weekend of the **ARRL International EME Competition** is December 4–5. This is the second weekend of the 50 MHz through 1296 MHz competition.For details, go to the ARRL's website: <www.arrl.org>.

And Finally . . .

BPL dominates this month's column, as it has in some previous columns. It is an important issue that needs discussing. We will continue to cover this issue both in this column and in the pages of *CQ VHF* magazine. If you have a pertinent item for this column or for *CQ VHF* magazine, please get in touch with me so that I can give you a venue for it.

Thank you again for your ongoing support for this, your column. With the holidays upon us, my wife Carol, W6CL, and I wish you the blessings of the season.

Until next month... 73, Joe, N6CL

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radio classics

BY JOE VERAS,* K9OCO

DX in the '60s

Perhaps the oldest adage in DXing is "If you can't hear them, you can't work them." Heeding these words, legions of hams have marched off in pursuit of better receivers and antennas. Optimizing the situation in your own shack won't necessarily solve the equation and put another rare one in your log. Communication is a two-way process. What kind of gear is in use on the other end? What if the DX can't hear you?

I'm not suggesting the purchase of a larger amplifier, particularly if you already are running the legal limit. Let's say you've done all you can. What about the other fellow?

This time we take a look at ham shacks on the DX end of the contact. Since this column is "Radio Classics," this won't be about DX stations of today, but rather some of those active when vintage equipment and vacuum tubes ruled the airwaves. Information I recently received from a reader triggered my interest in taking a closer look at the setups on the other end of a typical 1960s DX QSO.

A previous "Radio Classics" column (June 2004) initiated correspondence with Jim Noe, K6AR. Jim used some of the gear mentioned in that column back when he was WB6CWD, and we traded e-mails reminiscing about the equipment as well as our shared teen-age ham experiences. Jim spent many hours chasing DX back then, and he did so very successfully, collecting the QSLs to qualify for DXCC. Along the way, he accumulated equipment data from those cards, compiling it into the list that appears as Table I. Not all stations he contacted included information

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Photo A– The KW2000 transceiver, a U.K. cousin of the Collins KWM-2, was first manufactured in 1962 and came with a matching line of accessories (from the collection of Herman Cone, N4CH). (Photos © Joe Veras, 2004, all rights reserved)

Photo B– The Geloso G.4/218 general-coverage receiver (from the collection of N4CH).

on their setups, and most of the well-known DXpeditions of that era do not appear on the list. They usually were equipped with the latest gear, and their equipment was not typical of the average DX station.

Before we visit the ham shacks of 35 or 40 years ago, it might be a good idea to look at an area of the list that could prove unfamiliar to those who haven't been around that long. The world's geography hasn't changed physically in that time span, but both politics and ham radio have been in a state of flux. A quick scan of the callsign prefixes reveals many that don't exist now or no longer represent the same countries. As a matter of fact, we don't even call them countries anymore. They are *entities*! Of the 129 entities represented here, 38, or about 29% of the total, have changed their callsign prefix or country designation.

Some of the changes have been wholesale, as in the former Soviet Union or Balkan states. In other cases, former colonies gained independence and their own callsign prefixes one at a time. I have attempted to list all of the changes to Table I in Table II, but a sharp-eyed card checker for one of the major awards may catch some I missed. For an up-to-date list of changes consult the "ARRL DXCC List" publication or the DXCC section of the League's website at <www.arrl.org>. Of those changes listed, my favorite is that of MP4T (Trucial Oman) to A6 (Dubai). As a junior high school DXer, the name Trucial Oman had a fascinating and far-away sound to it. In my later years, the opportunity to visit Dubai and operate was no less fascinating.

The Equipment

Homebrew equipment is commonplace among stations on the list, and not just QRP-type gear either. Twenty-eight stations identified their transmitters as home made, and if the "probables" are included, the total easily is 50. Many transmitters are in the 100- to 200-watt range, running SSB as well as CW. What some rigs may have lacked in perfection, they made up for in personality. If you were on the air back then, and you concentrate hard enough, you probably can still hear some of the signals that identified an op as much as a name or callsign. Vintage ham radio was not pasteurized, homogenized, nor covered in shrinkwrap.

There are 24 Collins rigs among the transmitters. Almost all of them are S/Line transmitters or KWM-2 transceivers; there is one lonely 32V-2 transmitter. All of it is ubiquitous good stuff.

Less well known than Collins on these U.S. shores, but popular internationally, is the gear from KW Electronics. Much of that company's equipment found its way around the world from the factory in Dartford, Kent, England. The Viceroy transmitter appears on our list several times, as does the KW2000 transceiver (photo A), a U.K. cousin of the Collins KWM-2 first manufactured in 1962. This nicely turned out radio came with a matching line of accessories, and the B version sold in this country during the early 1970s. The Viceroy was a 100-watt, 80- through 10-meter, CW and SSB transmitter using a pair of 6146s in the final amplifier. It also could have been used on AM by unbalancing the balanced modulator and inserting a small amount of carrier. My photo collection is limited mostly to American

Station	Date	TX	RX	Antenna	Band	Mode
AP2AR	7/20/65	DX100B	NC-109	Quad	14	CW
BV1USA	2/25/66	32S3	75S3	TA-33	14	CW
CE3AG	3/10/65	S/Line	—	Tribander	14	CW
CEØAG	12/20/64	SR-150	—	14AVQ	14	CW
CM1AR	1/6/65	2/807	NC-57	2L	14	CW
CR4BB	6/1/65	70 W	AR88	LW	14	CW
CR5CA	8/27/67	Knight T-150	S-40A	Inv. V	21	CW
CR7IZ	3/27/65	120 W	HQ-129X	TA-33	21	CW
CR8AE	9/1/65	Swan 240	—	Cub. Quad	14	SSB
CR9AH	3/3/65	HX-10 + Pr. 813's GG	75A-4	2L	14	CW
CT2AM	10/6/65	Eico 720 25 W	S-40B	—	14	AM/SSB
CX2AJ	9/23/64	500 W	Super PRO	3L	14	CW
DL1RK	9/11/64	32V-2	51J-4	Dipole	14	CW
EI9J	12/31/64	813 150 W	"D/SH"	136' Zepp	14	CW
EP2RC	4/1/65	180 W	Drake 2B	Quad	14	CW
F8PI	10/25/64	DX-100 + SB-10	AR-88	3L	21	SSB
FB8WW	4/8/66	SR-150	SX-117	TH-3	14	SSB
FK8AU	12/14/65	Viking II	SX-111	TA33 Jr.	14	SSB
FL8RA	11/11/65	50 W	—	Dipole	14	CW
FO8AA	7/7/64	HX-50	—	—	14	CW
FR7ZD	9/14/64	150 W Homemade	HRO-60	Rot. Dipole	14	SSB
G3COL	1/4/66	Viceroy 150 W	13-tube Superhet	Dipole	14	CW
GI3RXV	9/9/64	2 X 807	AR-88	G5RV	14	CW
GM3VCQ	7/11/66	Sphinx 65 W	KW77	Dipole	14	SSB
HA7PR	5/31/65	Homemade 100 W	7 Tubes	Dipole	14	CW
HB9VW	11/18/64	Viking II 100 W	75A-3	Quad	14	SSB
HL9TS	10/24/64	KWM-2	—	Quad	14	SSB
HR1LM	9/11/64	SBE-33	—	TA-33	14	SSB
I1ORS	10/25/64	HT32B	SX-115	TH-4	21	SSB
IS1FIC	12/15/65	150 W Homemade	"Bendix RA1B + UKW"	3L	14	CW
JT1KAE	6/19/65	40 W	"Tesla"	GP	14	CW
K3UIG	8/18/64	Collins S-Line	—	TH-3	14	SSB
KA2KS	1/3/64	32S3	75S3	600' V-Beam	14	CW
KB6EPQ	8/19/64	KWM-2/30L1	—	TH-3	14	SSB
KC6BW	1/15/66	Swan 120 + SB-200	—	Vertical	14	SSB
KG1GE	6/5/65	Eldico/SDP1000L	Eldico	Rhombic	14	SSB
W6IBU/KG6	10/24/65	900 W	Drake 2B	TA-33	14	SSB
KG6IJ	12/7/64	KWM-2	—	3 L	14	SSB
KH6DSW	1/26/64	HT32A	75A-4	TH-4	14	CW
KJ6BZ	7/13/64	32S2/30S1	75S2	—	7	SSB
KL7JDO	11/27/65	KWM-2/30L1	75S1	TH-4	14	CW
KM6CE	6/26/63	HT37	SX-101A	Dipole	7	CW
KP4BOJ	3/15/64	100 W	HQ-170	Dipole	21	CW
KR6BQ	2/22/64	DX100B	R-390	TA-33	14	CW
KS6BO	2/21/65	Drake TR-3	—	4L Quad	14	SSB
KW6EB	9/11/64	HW-32 + 2/813's	—	—	14	SSB
KZ5FZ	4/19/64	Valiant 70 W	HRO-50	40 M Dipole	21	CW
LU1DAB	11/8/64	KWM-2	—	TA-33	21	SSB
DJ4GA/LX	10/1/65	30 W Home Made	Drake 2B	LW 25M	14	CW
LZ1KKZ	12/6/65	250 W	14-tube Super	Windom	14	CW
MP4TBO	4/25/65	80 W	Drake 2B	Dipole	14	CW
OA4PF	4/19/64	2 X 6146 180 W	Siemens 745E310A	2L Quad	21	CW
OH5PY	3/30/64	—	Drake 2B + 2BQ	2L Quad @ 17' H	14	CW
OHØNI	7/13/65	TR-3	—	Quad	14	SSB
OK1MP	5/26/65	150 W Homemade	12 Tubes Dbl. Conv.	GP	7	2XSSB
ON4FL	1/6/65	125 W	HRO	GP	14	CW
OY2J	3/10/65	18 W	6 Tubes	GP	14	CW
PJ2AA	9/25/64	GSB100-LA400C	75A-3	TA-33	14	CW
PX1EQ	7/14/65	KW Viceroy	Siemens E311	14AVS	14	SSB
PY2BGO	11/13/65	"XTAL Filter - 4-811A's"	209 Geloso	2L Rot Beam	14	SSB
PY2BZD/PYØ	9/24/65	TR-3 + RV-3	—	GP	14	SSB
PZ1BW	3/23/64	40 W	SX-101A	TA-33	14	CW
SM2CDW	4/1/66	400 W	S-85	Gp	14	CW
SP3KCC	3/2/65	150 W Home Made	"Lambda V"	21M LW	14	CW
ST2BSS	12/15/65	S-Line	—	—	14	SSB
VE6QG/SU	10/28/66	32S3	75S3	TH-6	14	SSB
SV1AE	10/21/66	32S1	75S1	TH-6	14	SSB

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gear, but you can find a picture of the KW Viceroy at <http://www.rigpix.com/kw/viceroymarkiii.htm>, SMØOFV's fine boatanchor site.

Five DX-100s (one on SSB with the SB-10 adapter) and nine other Heathkit transmitters and transceivers were heard from, putting signals on the air in places such as Pakistan, Wake Island, and Israel. Drake TR-3 and TR-4 transceivers were popular, as were the HT-series SSB exciters from Hallicrafters.

Another European company that sold ham gear (and other electronic equipment) all over the globe was Italy's Geloso. John Geloso, the company's founder, worked in America for the Pilot Radio Company when he was a young engineer, playing an important role in the development of the Pilot Super Wasp receiver. In 1931 he returned to Italy, setting up his own company in Milan to produce consumer radios, military communications gear, and electronic components. It was a sort of Milanese version of Malden's National Company.

John Geloso, I1JGM, introduced the first amateur gear into his company's product line in 1952 with the G.207 receiver. The ham-bands-only receiver was paired with the G.210 AM/CW transmitter in 1955. The G.4/218 receiver pictured in photo B is a general-coverage set of later manufacture, but all Geloso ham gear from the 1950s and '60s exhibited a strong family resemblance. The G.4/223 transmitter used by TR8AG was a 60-watt AM/CW rig using a 6146 modulated by a pair of 807s. This transmitter was introduced in 1964, and in '65 Geloso brought out its first sideband equipment, the G.4/225 transmitter and G.4/215 receiver. John Geloso died in 1968; his company lasted another four years. Products with the Geloso label continue to appear, but like National, it is a case of someone's having bought the name and placed it on goods made elsewhere.

Whatever transmitting apparatus was used, it is significant to note the power levels were uniformly modest. Only 10 to 15% of the stations listed were running what most consider serious power in terms of DX communications, kilowatts to make the kilowatt/hour meter at the service entrance of your house spin like crazy. Was it the antenna that made the difference? We'll look at that a little later.

Fewer stations reported using homebrew receivers rather than transmitters. The majority of those doing their own construction were hams from the former

Was		Now	UB	=	UZ
6O	=	T5	UD	=	4J
CR4	=	D4	UF	=	4L
CR5	=	S9	UL	=	UN
CR7	=	C9	UP	=	LY
CT2	=	CU	UQ	=	YL
FB8	=	5R	UR	=	ES
FL8	=	J2	VK9	=	C2
KB6	=	KH1	VP2K	=	V4
KC6	=	V6	VP7	=	C6
KG1	=	OX	VR2	=	3D2
KG6	=	KH2	VR4	=	H4
KG6I	=	JD1	VS4	=	9M6,8
KJ6	=	KH3	VS5	=	V8
KM6	=	KH4	VS6	=	VR2
KR6	=	JA6	ZD5	=	3DA
KS6	=	KH8	ZE	=	Z2
KW6	=	KH9	ZS3	=	B5
MD4T	=	A6	ZS8	=	7P
PX	=	C3			

Table II– Old and new prefixes for entities listed in Table I.

Station	Date	TX	RX	Antenna	Band	Mode
TF2WIU	4/21/64	KWM-1	—	Inv. V	14	CW
TG9SC	9/26/64	32S1/30S1	NC-303	TA-36	14	SSB
TR8AG	3/8/66	Geloso G4/223	Geloso G4/215	Doublet	14	CW
TU2BA	1/12/67	HT44	SX-117	TA33 Jr.	14	SSB
UA1KBB	7/18/65	200 W	Super 15 tubes	GP	14	CW
UA2BZ	7/13/65	40 W	12 t.	21M	14	CW
UA9PP	3/3/66	200 W	10 t.	3L Quad	14	CW
UB5DV	4/6/65	120 W	SH 14 tbs	"MBW"	14	CW
UD6AM	4/6/65	200 W	14 tubes	41M	14	CW
UF6HG	9/29/67	40 W	9 tubes	1/2-wave Dipole	14	CW
UL7BF	6/10/65	40 W	16 tubes	Dipole	14	CW
UP2NR	5/16/65	20 W	11 tub	Dipole	14	CW
UQ2KEM	5/9/68	40 W	17 tubes	DL7AB	14	SSB
UR2KAA	6/2/65	200 W	17 tubes	Cub Q	14	SSB
VK5XK/VK2	12/2/66	"2 Stage 25W"	—	Dipole	14	CW
VK3ALP	1/27/66	SB-10 + 813 Lin	Eddystone 750	Quad	14	SSB
VK9TL	9/1/65	SB-400	75S3A	1/2-wave Dipole	14	SSB
VKØMI	3/30/66	Homebrew 140 W	AR7	3L Beam	14	CW
VP2KX	7/8/66	NCX-3	—	GP	14	SSB
VP7BG	2/11/64	HX-20 90 W	Drake 2B	Dipole	7	CW
VP9EU	5/12/65	Apache	HQ-180	3L Beam	14	CW
VQ8AI	12/14/65	120 W	Lafayette H.E.3	LW	14	CW
VR2DK	3/29/64	—	—	—	3.5	CW
VR4CR	5/31/65	50 W 2X807	"B28 10 tubes"	1/2-wave Dipole	14	CW
VS4RS	2/23/64	Pr 6146 120 W	888A RX	LW	7	CW
VS5JC	5/10/66	50 W	"14 V."	LW	14	CW
VS6FF	2/23/64	75 W	HRO	Dipole	7	CW
VS9KRV	3/10/66	KW2000 90 W	—	Beam	14	SSB
VU2KV	2/4/67	100 W	51J2	Quad	14	SSb
XE2JS	12/17/63	75 W Homemade	S-77	Dipolo	7	CW
XE5L	12/12/65	TR-4	75S1	TH-3 Jr	14	SSB
XW8AZ	1/8/65	32S1	SX-117	4L Beam	14	SSB
YN1SL	9/9/64	Drake TR-3	—	TH-4	14	CW
YS1HUKE	12/1/64	32S-1/30L-1	75S-1	—	21	ssb
YO8CF	4/29/66	300 W	ssh 19 tubes + conv.	G5RV	14	CW
YU1KA	5/31/65	30 W	SX-43	Windom	14	CW
ZC4CI	5/24/66	Galaxy V	—	4L Beam	14	SSB
ZD5D	5/9/65	KW2000 1X811A 170 W	—	TA-33	14	SSB
ZD9BC	3/17/66	80 W	RX-88	Rhombic	14	CW
ZE1JE	10/24/64	HT32	HQ-170	TA-36	21	SSB
ZL1ABZ	9/13/64	Collins "S" Line	—	Hy-Gain Beam	14	SSB
ZP5CF	10/14/65	HT37 + LA-400C	Drake 2B	204BA	14	SSB
ZS3HT	11/20/65	SR-150	—	TH-4	14	SSB
ZS8L	12/16/66	SB400	SB300	TH3	14	SSB
4U1ITU	11/3/65	HT32B + HT33B	SX-117	TH-4	14	CW
4X4FU	12/22/64	HX-10	SX-115	3L Beam	14	CW
5A4TI	1/30/65	KWM-2 150 W	—	TA33 Jr.	14	SSB
5H3JR	5/22/65	KWM-2	—	Quad	21	SSB
5N2JKO	11/28/64	KW Viceroy 180 W	Eddystone 888A	TA33 Jr.	21	CW
5R8CQ	12/17/66	100 W	G65F	"Levy"	14	CW
5U7AK	10/22/66	SR-160	—	Dipole	14	SSB
5X5IU	12/21/64	135 W	SX-101A	Beam	14	SSb
5Z4JD	10/2/65	150 W	Gonset	Quad	14	CW
6O6BW	4/17/65	32S2/30L1	75S3A	TH4	14	SSB
6Y5MJ	11/29/64	150 W	Drake 2B	Dipole	7	CW
7Q7GN	12/21/64	HW-32	—	Quad	14	SSB
8R1G	3/4/67	KWM2/30L1	—	Quad	14	SSB
9G1FQ	1/17/65	KWM-2	—	TA33 Jr.	14	CW
9H1AG	10/12/65	DX100	AR88D	Quad	21	CW
9K2AN	12/13/65	DX100	SX-42	Hy-Gain 3L	14	CW
9M2AE	9/27/65	KW Viceroy	Drake 2B	TH-4	14	SSB
9U5DP	12/13/66	TR-4	—	2L Quad	21	SSB

Table I– Data compiled from the 1960s-era DX QSL cards received by Jim Noe, K6AR (then WB6CWD).

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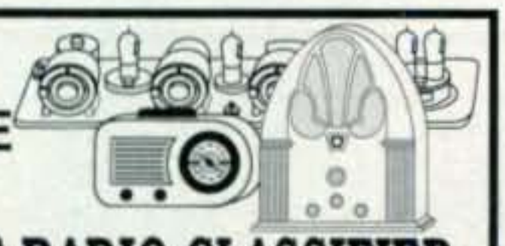

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Soviet Union, and many of the receivers were ambitious, technically advanced projects. About 15% of the list fall into the homebrew receiver category. The commercial transceivers in use at 20% of the stations took care of the receiver along with the transmitter. Drake, Collins, Heathkit, Swan, Hallicrafters, KW Electronics, and National all are represented here. Collins leads the receiver parade with 14 S/Line receivers and seven other models, and the receivers in seven KWM-2s and one KWM-1 add to the company's count. Drake made a strong showing on the mid-'60s international scene as well. Nine of the 2-B receivers are on the list, as well as four TR-3 transceivers and a pair of TR-4s.

Hallicrafters, perhaps on the strength of its DXpedition advertising, did well, too. Ten receivers—including the SX-101A, SX-111, SX115, and SX117 models (all from the early '60s)—as well as four SR-series transceivers were used in our DX stations. Four ops listed Hallicrafters receivers from the 1940s and early '50s on their QSLs. National didn't show in nearly the same strength as its stateside competition, with seven receivers and a single transceiver. Apparently, things had changed by the 1960s. From what I remember about looking at pictures of DX stations in ham magazines a decade earlier, they seemed to be full of older HROs.

Geloso initiated its ham equipment line with a receiver and after 1955 always had a matching transmitter to make a pair. Despite the twin appearance, none of the pairs was capable of operating in transceiver configuration. The G.4/209 receiver used at PY2BGO was introduced in 1958. It was a 12-tube, double-conversion superhet with a crystal filter and ham-band-only coverage of 80–10 meters. The G.4/215 used at TR8AG came along in 1965 and was a single-conversion, ham-band receiver using 11 tubes.

In addition to making the receiver list with its KW2000 transceiver, KW Electronics was also present in the shack of Scotsman GM3VCQ with a stand-alone receiver. He used the KW77, a 16-tube, triple-conversion set that covered the HF (160–10 meter) ham bands. It employed a tunable slot at 50 kHz and audio filtering for selectivity and had linear dial calibration. The KW77 was made in 1964. A photo can be found at <http://www.rigpix.com/kw/77.htm>. Another popular U.K. manufacturer is Eddystone; its receivers were used at VK3ALP and 5N2JKO.

The venerable RCA AR-88 is not to be forgotten. This receiver was produced during World War II with most going to England. After the war they seemed to spread around the world. They also once were standard fare in the photos of DX shacks, and it is nice to see several were still in use 20 years after the last one left the factory.

When the last contacts on this list were made, 80% of DX stations still used separate transmitters and receivers. In the years immediately following, a tidal wave of transceivers flooded shacks around the world, often improving the equipment available, making operation simpler, and changing the way DX was worked. Many early transceivers had limited or no RIT, and remote VFOs were expensive accessories. As it had been for decades before, the DX game was most often won by the savvy operator, the one who listened and learned before calling, then knew precisely when and where to call.

Now that we've taken a good look around the shack, it's time to go outside and turn our gaze skyward. What kind of antennas did our sampling of DX stations use?

The Antennas

Looking first for wires, we notice 21 stations used conventional dipoles. Two had the G5RV multiband variety, and one station was end-feeding an 80-meter halfwave with balanced line, making it a Zepp. Two others opted for the Windom configuration, while another pair of stations used a single support to hang their dipoles as inverted-Vees. There were some *big* wire antennas, too! KA2KS (Japan back then) had a 600-foot per leg Vee beam, and two other stations had rhombics. To many stations, a wire antenna means just that . . . a piece of wire, one which goes from here to there. Fifteen stations on the list used something fitting that description. In the context of a DX contact, GP for antenna means general purpose, or random-length wire. Of the 129 stations on the list, 46 used some form of wire antenna. Keep in mind that all but a few of these contacts were made on the 15- and 20-meter bands.

Quads proved to be popular, with 19 in evidence here. The Yagi, in various forms, was the antenna most often used by the stations listed. Forty-seven of them had a beam of two, three, four, or more elements—trapped and untrapped. One station used a 20-meter antenna with fewer than two elements: FR7ZD listed a rotary dipole. Only three DX ops used verticals. The trap tribander was the overwhelming favorite among stations using beams, with num-

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bers split between the Hy-Gain and Mosley camps.

The time capsule opened here in the above paragraphs presents the DX-ploits of one young man, looking not at his own shack and antenna farm, but at the working conditions on the other end. I am indebted to Jim, K6AR, for compiling the information and agreeing to share it.

de Otto, PZ1AC

In recent months I have corresponded with Otto Morroy, PZ1AC, in Suriname. His hobby and professional lives have never been far from electronics and communications. Otto's ham career began as a 15-year-old in 1939, experimenting with a Ford spark coil transmitter on 160 meters. In 1942 he was drafted into the army, serving in the signal corps during the war. He was instrumental in petitioning the Dutch colonial government to allow amateur operation and was one of the first to earn a PZ license in 1947. Along the way, Otto built his own equipment or pressed unlikely pieces of commercial gear into service. His homebrew projects included a number of beam antennas, all of them made from iron tubing! One such antenna was the G4ZU triband beam. Dick Bird's design was popular in the 1950s, and construction details were published in ham magazines all over the world. A version appeared in the November 1959 *CQ*.

During the time period discussed in this column, Otto used a separate transmitter and receiver combination from Yaesu at PZ1AC before moving on to a transceiver in the 1970s. A TH6DX from Hy-Gain eventually replaced his iron antennas. Our e-mail correspondence has covered so much more ground than I have room to relate here. In addition, Otto has documented much of the PZ1AC history with pictures. I would like to share those with you, too, but the reproduction of web-resolution photos in a magazine is usually disappointing. What I decided to do is post this material on my website, giving you a look in words and pictures at a ham career spanning more than five decades in Suriname. Use this link: <http://www.jveras.com/radio/pz1ac.htm. Thanks, Otto, for taking the time to send your material and for your kindness in sharing it with this column's readers.

In Closing . . .

This time of year finds many of us busy with holiday activities. Others simply are trying to finish the list of things they planned to accomplish in 2004 but have been putting off since January 1st. I fit both descriptions, yet want to take a quiet moment, slow down, and talk with you, the column's readers. On the air, after repeated QSOs, we may come to feel as if we really know people whom we've never met—possibly will never meet. It is one of amateur radio's signature joys.

So it is with the "Radio Classics" column. I don't sit here addressing a blank piece of paper or word-processor screen. I see before me real people, with real lives and families. In the spirit of the season—whatever your personal tradition may be—I wish you and yours the Very Best. As for the new year, may it bring you health, prosperity, and all that your ham's heart desires, too.

Oh yes, I almost forgot! With a new year on the way, it would be good to have a new calendar. It just so happens I have one I can recommend highly; it has 15 excellent photographs of vintage radios, done in a retro style appropriate to the subject matter. The photographs are by . . . well, uh . . . Joe Veras, K9OCO. Who told me they were excellent? My mother, right after she told me to clean my plate or no dessert. Seriously, we all are proud of the 2005/2006 Radio Classics calendar and are happy to offer it again after an absence of a couple of years. How can you get a calendar? Details for ordering are right here in *CQ* on page 73.

73, Joe, K9OCO

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beginner's corner

BY WAYNE YOSHIDA,* KH6WZ

Rainy-Day Projects

Did you have "rainy-day projects" when you were young? Our family sure did. When it was either too cold or too wet to play outside, we were stuck inside the house playing "board games" or cards or what-have-you. Most of the time, it ended up being a day to clean and pick up our rooms.

As the weather changes, let's think about some rainy-day projects *(in southern California; "snowy-day projects" for most of the rest of us!—ed.)* we can do in and around the ham shack. We can start with the clean-your-room idea. . .

Use a vacuum cleaner to remove dust and lint from the inside of your equipment. Here is my bench power supply getting a nice cleaning. Various vacuum attachments and tools do come in handy.

Clean Up and Clean Out Your Station

It's amazing how much dust and lint can accumulate inside, under, and around electronic devices. Start from the top and work your way down, dusting and vacuuming. When you're done with that, take your tools out and work on the inside of your rigs. Unplug the power and other cables first. Open the cabinets and carefully use your vacuum cleaner to suck out dust and lint (see photo).

Cotton swabs and a "can of air" (such as DustOff) will also be useful in doing this task. Avoid chemical cleaners, both from an environmental standpoint and as a precaution to prevent damage to the plastics and electronic components inside your equipment. I use a rule from an automotive detailer I once knew: First, go easy. Second, use the mildest form of washing first, and then move to stronger stuff if that does not work.

In other words, start off with a soft towel moistened with a little bit of water. You will be amazed at how much crud you can remove this way. If that does not work, go to a soft cloth moistened with diluted window cleaner (half and half). If that doesn't work, I move to a heavily diluted solution of a household grease cutter such as Formula 409 or something similar.

You may use an environmentally friendly product such as SimpleGreen, but you must be careful to dilute as directed, and remember that if you use it to clean aluminum, make sure to rinse very thoroughly, since SimpleGreen can corrode aluminum. Sunshine Makers, Inc., the makers of SimpleGreen, recommends that, in addition to rinsing thoroughly, exposure to bare metals should be less than 10 minutes.

After the inside is nice and clean, move to the outer cabinet. If the outside cabinet is not textured, polish the paint with a good automotive cleaner-wax. I use Meguiar's car cleaner-wax for my car, and so I use it on my metal cabinets as well.

Textured metal cabinets are a little different. I discovered the hard way that waxing these textured paints is not a good idea, since the wax will leave a whitish coating stuck inside the very tiny nooks and crannies in the paint. Instead, brush them with a soft nylon bristle brush.

Inventory Your Junk Box

Have you ever wasted money on "store-bought parts" for a new project because you forgot you had something you needed or couldn't find it? I sure have. If you are even a casual builder, you will have a "junk box" of some kind. See "A Look at Homebrewing" in the September 2003 issue of *CQ*. Thus, every now and then I take some time to list what I have, what I am running low on, and what I should buy next. This is beneficial because

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it not only saves me money, it also lets me know at a glance if I will be able to help someone looking for a particular doo-dad. Also, while taking inventory of the junk box, it may be a good idea to test parts or modules to make sure they are good. Otherwise, you may waste even more time by installing an unknown but bad part somewhere in a project. Avoid the frustration and disappointment of completing a project that does not work the first time by making sure the parts you use are all good. Throw out or recycle anything that does not work before this happens. Of course, having good or bad parts is not the only success or failure point in project-building, but we should at least eliminate as many traps for failure as we can from the beginning.

While we are examining junk-box parts, it may be a good idea to label the surplus bits with useful data so you will not have to test them all over again later. For example, write down the pin-outs or voltage levels or other notes on a label and mark the unit.

Increase Compatibility

Another rainy-day project can be increasing your intra- and inter-station compatibility. Start with your power supply. Everything that operates from 12 VDC should be compatible with other 12-VDC units. Standardize on a specific connector and polarity arrangement. Make sure you use wires and connectors that can handle the current requirements, and do not forget to fuse power connections properly. Many clubs and public-service organizations have adopted a standard power connector, called the Anderson PowerPole. See "Go Gel-Cell" in the February 2004 issue of *CQ* for some hints on how to use this versatile connector.

Make Your "Go Kit" Ready

Check to make sure your emergency gear is set to go in case "something bad happens." If you do not have emergency gear, you may want to think (and do something) about that. At least you should have a plan in place so that you can handle a communications emergency when the time comes. Think about how you would handle a power outage in your home ham shack, or what would happen if you lost access to your mobile rig.

Make sure you change the contents for the rainy season, or whatever season and weather conditions you have now. If you are active in RACES, ARES, or other public-service organizations, this may be a routine thing for you. In any case, as the Boy Scouts say, "Be prepared." You may want to review the April 2003 "Beginner's Corner" for a brief rundown of what a typical Go Kit should contain.

Plan Your Next Operating Event

There's never too much planning. However, that is not to say that everything goes as planned. In any case, this can be a good time to plan for your next Field Day, contest, or special-event station. For example, you can prepare handouts on your club or group, so you can inform passers-by about ham radio and possibly recruit new members.

Computer Stuff

Back up your computer hard disk. After experiencing one hard-disk "crash," I'll tell you that you should *not* wait for a rainy day on this one. Do it now! Organize files and folders so you can retrieve information, since having the information is one thing and actually using it is another.

Paperwork

If you work any HF or DX, you can sort your QSL cards. You may be surprised at what awards you have qualified for. Or the other way around, you may find that you are missing such and such for an award. In any case, sort out that paperwork. If you keep a log (and you really should), take a look to see if you made any "notes to self" and take care of any loose ends that never seemed to make the "done" list.

Return It

Return all the stuff you borrowed. At least, renew the loan by contacting the owner to reassure the generous person that you still have whatever it is you borrowed and it is still in good condition. By the same token, you may want to "fess up" and admit that you broke something you borrowed, and replace it for the owner. In other words, this is a good time to make things "good."

Last, But Not Least

Spend some "quality time" with your non-ham friends and/or your spouse. Let her/him/them know how much you appreciate their patience and understanding when you need to be someplace else for some very strange and incomprehensible ham radio reason, like a contest or when a rare DX station is on . . .

73, Wayne, KH6WZ

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BY CARL SMITH,* N4AA

Some Top Most Wanted Countries On the Air

We're well into the fall/winter DX and contest season. The holiday season is upon us, and I take this opportunity to wish each of you the very best for the season and the coming year.

After all of the hurricane activity in September and October I'm glad to see the end of that season for 2004. Untold numbers of people are still struggling to put their lives back together following the devastating effects of these storms. Even here in the mountains of North Carolina, hundreds of miles from the ocean, we were seriously affected by the rain, which caused severe flooding and the loss of 12 lives. Hurricane Ivan closed down our airport and prevented me from making the trip to Chicago for the W9-DXCC Convention. Sorry I couldn't make it this year, but it was beyond my control. Hopefully I'll be there next year.

October proved to be a bonanza for DXing, with several DXpeditions taking place. I hope you were able to work any of them that you needed to fill in the blanks on your band/mode list.

The following DXpeditions represent some of the top Most Wanted countries. Some time ago a major DXpeditioner indicated that it typically takes about ten years for a most needed country to climb back into the top ten Most Wanted, and that does appear to be the case.

3YØX, Peter I

I've talked about this one before. It is scheduled for January 2005. The planning and effort to put together an operation to the Antarctic is enormous. I'm including a few pictures of a planning session held by the team in the Atlanta, Georgia area the end of September. They went through the setting up of the shelters to be used, as well as equipment setup and checkout before packing it all up for shipment to Chile. Peter I was ranked #7 on *The DX Magazine*'s Most Wanted Survey for 2003.

FK/C, Chesterfield

The German team is enroute to the island as this is being written in mid-October, so I can't say much about the operation at this time. They are scheduled to be active from the island for about nine

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CQ DX Awards Program

SSB

2443	YT1FM	2445	YV2FEQ
2444	YC9WZJ	2446	YC3DIK

CW

1062	KA3S

SSB Endorsements

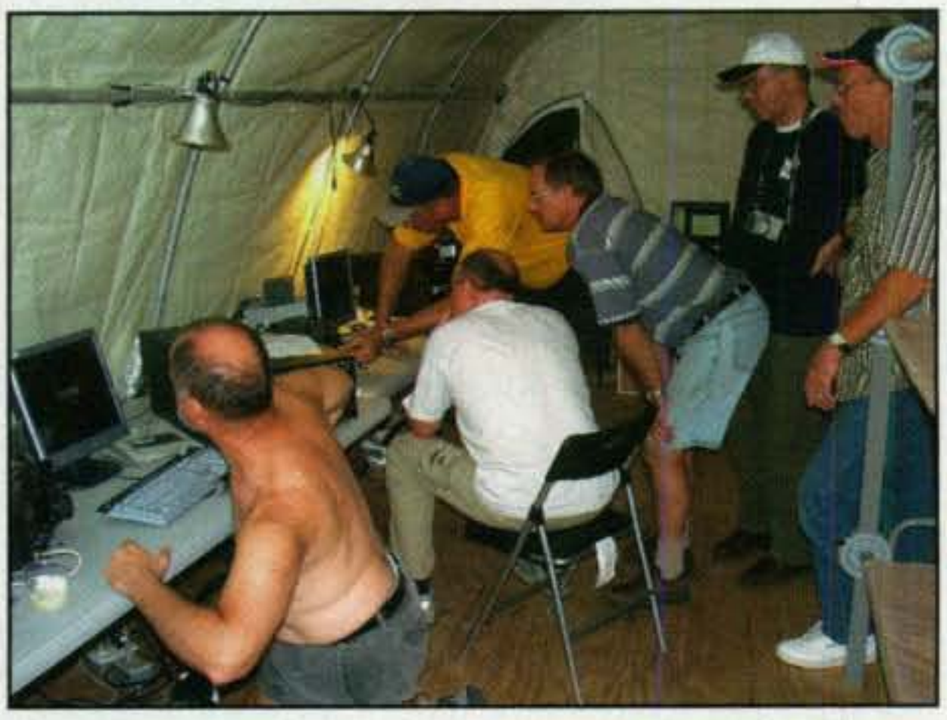
320	CT3BM/334	150	YC9WZJ/154
300	YV2FEQ/301	28 MHz	N2LM
300	N5WYR/300	3.5/7 MHz	N2LM
275	N2LM/286		

CW Endorsements

320	N4CH/332	320	KA3S/320
320	K7JS/329	200	N2LM/211
320	K6CU/326		

The basic award fee for subscribers to *CQ* is $6. For non-subscribers, it is $12. In order to qualify for the reduced subscriber rate, please enclose your latest *CQ* mailing label with your application. Endorsement stickers are $1.00 each plus SASE. Updates not involving the issuance of a sticker are free. All updates and correspondence must include an SASE. Rules and application forms for the CQ DX Awards may be found on the <www.cq-amateur-radio.com> website, or may be obtained by sending a business-size, self-addressed, stamped envelope to CQ DX Awards Manager, Billy Williams, N4UF, Box 9673, Jacksonville, FL 32208 U.S.A. Currently we recognize 335 active countries. Please make all checks payable to the award manager.

The 3Y0X team held a planning session the Atlanta, Georgia area the end of September. Here they are shown practicing setting up shelters. (Photo courtesy of Bob, K4UEE)



Members of the 3Y0X team checking equipment before packing into a shipping container. (Photo courtesy of Bob, K4UEE)

The WPX Program

SSB

2914 .....W3LL 2916 .....WO7GI
2915 .....VE3TUQ

CW

3142 .....AA4FU 3143 .....DL5XL

Mixed

1946 .....DL9NO

CW: 750 DL5XL. 850 PP6CW. 950 OM7CA. 1350 KØARS. 2250 JN3SAC.
SSB: 550 KT2C. 700 AE9DX. 1200 W3LL. 1350 WM4R. 1500 JN3SAC. 1800 KWØU.
MIXED: 1750 OZ5YL. 1950 JA6GWU. 2050 W9JDX. 5450 W2FXA.

10 Meters: W3LL
15 Meters: W3LL
20 Meters: AA4FU, W3LL
40 Meters: W3LL, OM7CA
80 Meters: W3LL
160 Meters: W3LL, OM7CA
North America: W3LL, AA4FU
South America: W3LL
Asia: W3LL, G3TSZ
Europe: W3LL, AA4FU

Award of Excellence Holders: N4MM, W4CRW, K5UR, K2VV, VE3XN, DL1MD, DJ7CX, DL3RK, WB4SIJ, DL7AA, ON4QX, 9A2AA, OK3EA, OK1MP, N4NO, ZL3GQ, W4BQY, IØJX, WA1JMP, K0JN, W4VQ, KF2O, W8CNL, W1JR, F9RM, W5UR, CT1FL, WA4QMQ, W8ILC, VE7DP, K9BG, W1CU, G4BUE, N3ED, LU3YL/W4, NN4Q, KA3A, VE7WJ, VE7IG, N2AC, W9NUF, N4NX, SMØDJZ, DK5AD, WD9IIC, W3ARK, LA7JO, VK4SS, I8YRK, SMØAJU, N5TV, W6OUL, AB0P, FM5WD, I2DMK, SM6CST, VE1NG, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, HA8XX, K7LJ, SM3EVR, K2SHZ, UP1BZZ, EA7OH, K2POF, DJ4XA, IT9TQH, ONL-4003, W5AWT, KBØG, HB9CSA, F6BVB, YU7SF, DF1SD, K7CU, I1PO, K9LNJ, YBØTK, K9QFR, 9A2NA, W4UW, NXØI, WB4RUA, I6DQE, I1EEW, I8RFD, I3CRW, VE3MC, NE4F, KC8PG, F1HWB, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, KC7EM, YU1AB, W5ODD, IØRIZ, I2MQP, F6HMJ, HB9DDZ, WØULU, K9XR, JAØSU, I5ZJK, I2EOW, IK2MRZ, KS4S, KA1CLV, KZ1R, CT4UW, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, OE1EMN, W9IL, S53EO, DF7GK, I7PXV, S57J, EA8BM, DL1EY, KØDEQ, KUØA, DJ1YH, OE6CLD, VR2UW, 9A9R, UAØFZ, DJ3JSW, HB9BIN, N1KC, SM5DAC, RW9SG, WA3GNW, S51U, W4MS, I2EAY, RAØFU, CT4NH, EA7TV, W9IAL, LY3BA, K1NU, W1TE, UA3AP, EA5AT, OK1DWC, KX1A, IZ5BAM, W4BP, K4LQ, KØKG, DL6ATM, VE9FX, DL2CHN, W2OO, AI6Z, RU3DX, WB9IHH, CT1EEN, G4PWA, OK1FED, EU1TT.

160 Meter Endorsement: N4MM, W4CRW, K5UR, VE3XN, DL3RK, OK1MP, N4NO, W4BQY, W4VQ, KF2O, W8CNL, W1JR, W5UR, W8RSW, W8ILC, G4BUE, LU3YL/W4, NN4Q, VE7WJ, VE7IG, W9NUF, N4NX, SMØDJZ, DK3AD, W3ARK, LA7JO, SMØAJU, N5TV, W6OUL, N4KE, I2UIY, I4EAT, VK9NS, DEØDXM, UR1QD, AB9O, FM5WD, SM6CST, I1JQJ, PY2DBU, HI8LC, KA5W, K3UA, K7LJ, SM3EVR, UP1BZZ, K2POF, IT9TQH, N8JV, ONL-4003, W5AWT, KBØG, F6BVB, YU7SF, DF1SD, K7CU, I1POR, YBØTK, K9QFR, W4UW, NXØI, WB4RUA, I1EEW, ZP5JCY, KA5RNH, IV3PVD, CT1YH, ZS6EZ, YU1AB, IK4GME, WX3N, WBØDD, IØRIZ, I2MQP, F6HMJ, HB9DZZ, K9XR, JAØSU, I5ZJK, I2EOW, KS4S, KA5CLV, KØIFL, WT3W, IN3NJB, S50A, IK1GPG, AA6WJ, W3AP, S53EO, S57J, DL1EY, KØDEQ, DJ1YH, OE6CLE, HB9BIN, N1KC, SM5DAC, S51U, RAØFU, UAØFZ, CT4NH, W1CU, EA7TV, LY3BA, RW9SG, K1NU, W1TE, UA3AP, OK1DWC, KX1A, IZ5BAM, W4GP, DL6ATM, W2OO, RU3DX, WB9IHH, G4PWA, OK1FED, EU1TT.

Complete rules and application forms may be obtained by sending a business-size, self-addressed, stamped envelope (foreign stations send extra postage if airmail desired) to "CQ WPX Awards," P.O. Box 593, Clovis, NM 88101 USA. *Note: WPX will not accept prefixes/calls which have been confirmed by computer-generated electronic means.*

Please Note: As of February 2004, the price of the 160 meter bar for the Award of Excellence is now $6.50.

5 Band WAZ

As of October 1, 2004, 662 stations have attained the 200 zone level and 1413 stations have attained the 150 zone level.

New recipients of 5 Band WAZ with all 200 zones confirmed:
EW4MM

The top contenders for 5 Band WAZ (zones needed, 80 meters):

N4WW, 199 (26)
W4LI, 199 (26)
K7UR, 199 (34)
WØPGI, 199 (26)
W2YY, 199 (26)
VE7AHA, 199 (34)
IK8BQE, 199 (31)
JA2IVK, 199 (34 on 40m)
NN7X, 199 (34)
IK1AOD, 199 (1)
DF3CB, 199 (1)
GM3YOR, 199 (31)
VO1FB, 199 (19)
KZ4V, 199 (26)
W6DN, 199 (17)
W6SR, 199 (37)
W3NO, 199 (26)
K4UTE, 199 (18)
HB9DDZ, 199 (31)
RU3FM, 199 (1)
HB9BGV, 199 (31)
N3UN, 199 (18)
OH2VZ, 199 (31)
K5MC, 199 (22)
W1JZ, 199 (24)
K2UU, 199 (26)
W1FZ, 199 (26)
SM7BIP, 199 (31)
PY5EG, 199 (23)
SP5DVP, 199 (31 on 40)
W8AEF, 199 (40)
K8RR, 199 (26)
UU5JR, 199 (4)
W8GF, 199 (22)
N4NX, 199 (26)
N4MM, 199 (26)
EA7GF, 199 (1)
N4PQX, 199 (26)
DL2KQ, 199 (31)
JA5IU, 199 (2)
CT3DL, 199 (26)
EA5BCX, 198 (27, 39)
G3KDB, 198 (1, 12)
KG9N, 198 (18, 22)
JA1DM, 198 (2, 40)
9A5I, 198 (1, 16)
K5PC, 198 (18, 23)
K4CN, 198 (23, 26)
G3KMQ, 198 (1, 27)
N2QT, 198 (23, 24)
OK1DWC, 198 (6, 31)
W4UM, 198 (18, 23)
US7MM,198 (2, 6)
K2TK, 198 (23, 24)
K3JGJ, 198 (24, 26)
W4DC, 198 (24, 26)
N4XR, 198 (22, 27)
RU3DX, 198 (1, 6)
N6HR/7, 198 (34, 37)
OE2LCM, 198 (1, 31)
W7SX, 198 (18, 23)
HA1RW, 198 (1, 31)
WK3N, 198 (23, 24)
HA9RT, 198 (1, 31)
W9XY, 198 (22, 26)
KZ2I, 198 (24, 26)

The following have qualified for the basic 5 Band WAZ Award:

N2LM (163 zones)
WØIKD (154 zones)
VE3LYC (170 zones)
PY2IQ (170 zones)
T94GB (170 zones)
KA3S (170 zones)

Endorsements:

EW4MM (200 zones)
K8VFV (167 zones)

****Please note: Cost of the 5 Band WAZ Plaque is $80 ($100 if airmail shipping is requested).**

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award Manager, Floyd Gerald, N5FG, 17 Green Hollow Rd., Wiggins, MS 39577. The processing fee for the 5BWAZ award is $10.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $15.00 for nonsubscribers. An endorsement fee of $2.00 for subscribers and $5.00 for nonsubscribers is charged for each additional 10 zones confirmed. Please make all checks payable to Floyd Gerald. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. N5FG may also be reached via e-mail: <n5fg@cq-amateur-radio.com>.

The WAZ Program

10 Meter SSB

568 .....EA8AYV

17 Meter SSB

37 .....EA8AYV

20 Meter SSB

1132 .....JE1CPB

12 Meter CW

45 .....JN3SAC

40 Meter CW

239 .....JH1SBE

All Band WAZ
SSB

4935 .....KI5GO 4937 .....VE3LYC
4936 .....IZ2ABN 4938 .....VE7BV

Mixed

8324 .....JH1OJY 8325 .....JF7VVL

All CW

437 .....7M4AOE 439 .....VE3LYC
438 .....KB8OMG 440 .....VE7BV

Rules and applications for the WAZ program may be obtained by sending a large SAE with two units of postage or an address label and $1.00 to: WAZ Award Manager, Floyd Gerald, N5FG, 17 Green Hollow Rd., Wiggins, MS 39577. The processing fee for all *CQ* awards is $6.00 for subscribers (please include your most recent *CQ* mailing label or a copy) and $12.00 for nonsubscribers. Please make all checks payable to Floyd Gerald. Applicants sending QSL cards to a *CQ* checkpoint or the Award Manager must include return postage. N5FG may also be reached via e-mail: <n5fg@cq-amateur-radio.com>.

days. I hope to have something more about the operation next month.

FR/G, Glorioso

Ranked #13 on *The DX Magazine*'s Most Wanted Survey for 2003, we are hearing about plans for a DXpedition in May 2005. Here is what was released in mid-October:

The Clipperton DX Club (CDXC) Team Europa 2003 will become CDXC Glorioso 2005! With Didier, F5OGL, and Rafik, F5CQ, organizing and Dany, F5CW, in charge of technical issues, they have an agreement in principle to organize, in May 2005, a DXpedition to Glorioso island. Date permitting, we are looking for an entry in the CQ WPX CW Contest. This expedition could last two weeks.

The QSL manager will be F5CQ for both bureau or direct requests. The callsign will be announced at a later date.

The team could be Didier, F5OGL; Freddy, F5IRO; Pascal, F5PTM; perhaps Dany, F5CW; and some others. Like Europa, the full team must be composed of French servicemen according to the high sensitivity of this area. Furthermore, the transportation will be supported by French forces.

We know that, like Europa, our means of transportation could be called elsewhere, following the international situation. In such a case, the DXpedition could be delayed and even canceled at the last minute.

As they did on Europa, the team, along with French forces and IFREMER cooperation, will give support to protecting the turtles, a quite endangered species.

FT1ZL, Amsterdam Island

Sebastian was expected to receive "official" authorization at any time to operate on the HF bands, according to Dany, F5CW. Another note from Dany: "Remember that Seb is a 'novice' on HF and in ham radio traffic ... so be patient and keep cool in huge pile-ups. He

THE WPX HONOR ROLL

The WPX Honor Roll is based on the current confirmed prefixes which are submitted by separate application in strict conformance with the CQ Master Prefix list. Scores are based on the current prefix total, regardless of an operator's all-time count. Honor Roll must be updated annually by addition to, or confirmation of, present total. If no up-date, files will be made inactive.

MIXED

5264 9A2AA	3808 N6JV	3284 WB2YQH	2944 IT9QDS	2510 K9UQN	2175 WB3DNA	1773 W7CB	1535 AI6Z	1090 W2OO
4792 W2FXA	3768 YU1AB	3246 KØDEQ	2824 W2ME	2457 JN3SAC	2070 I2EAY	1772 VE9FX	1521 NG9L	933 SM7GXR
4257 W1CU	3668 N4MM	3234 JH8BOE	2772 YU7GMN	2422 W8UMR	2018 HA9PP	1741 AB5C	1487 WT3W	865 N5DD
4211 9A2NA	3589 N5JR	3166 K9BG	2744 9A4W	2399 W6OUL	2005 VE6BF	1705 W2EZ	1472 OK1DWC	825 KL7FAP
4149 EA2IA	3548 N9AF	3140 I2EOW	2720 K2XF	2385 K5UR	1976 DJ1YH	1697 Z35M	1369 KW5USA	803 VE3NQK
4111 F2YT	3489 SM3EVR	3121 PAØSNG	2705 W9IL	2287 OZ1ACB	1958 CT1EEB	1674 YBØAI	1226 EA2BNU	742 K5IC
4038 N4NO	3395 S53EO	3082 IK2ILH	2701 WA1JMP	2212 PY2DBU	1837 AA1KS	1561 N1KC	1220 K6UXO	738 AK6I
3822 VE3XN	3379 I2MQP	3011 W2WC	2598 W9OP	2203 W4UW	1823 KØKG	1560 KX1A	1130 PY1NEW	710 KØCF
3816 I2PJA	3291 KF2O	2987 HAØIT	2550 W7OM					

SSB

4509 IØZV	3226 EA2IA	2734 4X6DK	2259 K5RPC	1973 I3ZSX	1698 W6OUL	1458 JN3SAC	1190 K4CN	872 K1BYE
4027 ZL3NS	3215 I2MQP	2646 LU8ESU	2209 IK2QPR	1969 CT1EEB	1669 W2FKF	1386 IK4HPU	1162 EA5DCL	851 KU4BP
4018 VE1YX	3160 N4NO	2618 OE2EGL	2143 W2WC	1954 CT1EEN	1615 KI7AO	1384 LU3HBO	1148 AG4W	822 W8UMR
3793 I2PJA	3049 F2VX	2594 I8KCI	2094 LU5DV	1942 W7OM	1562 W2ME	1259 I2EAY	1143 EA3EQT	812 KU6J
3765 F6DZU	3036 CT1AHU	2563 KF7RU	2028 K5UR	1937 I8LEL	1562 SV3AQR	1256 VE7SMP	1078 EA3KB	776 YBØAI
3373 9A2NA	3004 N5JR	2516 EA1JG	2027 NQ3A	1862 EA7TV	1538 VE9FX	1238 LU4DA	1043 AI6Z	737 IK8OZP
3353 EA8AKN	3000 I4CSP	2509 EA5AT	2021 N6FX	1806 K3IXD	1520 DF7HX	1218 WT3W	990 HA9PP	733 AK6I
3307 OZ5EV	2817 I2EOW	2432 IN3QCI	2014 K2XF	1721 DK5WQ	1480 AB5C	1215 W3LL	934 KX1A	670 VE6BF
3260 CT4NH	2782 KF2O	2325 CX6BZ	1994 W4UW	1704 IT9SVJ	1460 NG9L	1194 N1KC	903 N9DI	601 K7SAM
3234 N4MM	2741 PAØSNG	2289 HAØIT	1993 W9IL	1701 K8MDU				

CW

4356 WA2HZR	2959 9A2NA	2386 EA7AZA	2146 N6FX	1939 K5UR	1841 W6OUL	1520 4X6DK	1203 K6UXO	953 PY4WS
3655 K9QVB	2948 LZ1XL	2380 KF2O	2120 JN3SAC	1907 W9IL	1718 I2EAY	1430 EA2CIN	1158 YU1TR	898 WT3W
3610 N4NO	2694 N5JR	2268 W8UMR	2112 OZ5UR	1893 EA5YU	1712 I2MQP	1352 WO3Z	1132 WA2VQV	767 VE9FX
3361 VE7DP	2476 W2WC	2260 I7PXV	2043 K2XF	1882 W7OM	1584 IK2ECP	1337 AC5K	1048 KX1A	642 PP6CW
3229 EA2IA	2416 KA7T	2149 K9UQN	2036 IK3GER	1867 VE6BF	1531 I2EOW	1235 AI6Z	998 T94GB	624 W9IND

doesn't work CW, so please don't ask." It would be good to have this one on the bands, as it is ranked #22 on the Most Wanted list.

FT5W, Crozet

Ranked #14 on *The DX Magazine*'s Most Wanted survey for last year, Crozet will be seeing some activity early in 2005. Jean Paul, F5BU/FT5WG, and Nicolas, F4EGX, will be working on the island for a few months. They will operate in their spare time. More information is expected as the time draws near.

P2, Papua New Guinea

Roger, G3SXW, and Nigel, G3TXF, turned up from Papua New Guinea and put forth their usual outstanding performance on CW as P29SX and P29XF, respectively.

A gathering of European DXers: Al, HB9BGN; Kurt, HB9MX; Rudi, DJ3HJ; Jan, DJ8NK; and their host, Franz, DJ9ZB. (Photo courtesy of DJ9ZB)

VK9L, Lord Howe

This operation is on the air as this is being written, continuing until October 23. Early reports of minor problems seem to have been resolved, and they are reported on many bands/modes. The two YL ops on the team are making many SSB QSOs.

VU4, Andaman

At the very top of the Most Wanted rankings for last year, Andaman could see activity in late 2004. Two DXers from India, VU2RBI and VU2WAP, reportedly were seeking permission to operate from Andaman. They were operating independently of one another, although both were asking for signed letters from interested DXers in support of their requests to the government for permission to operate.

Congratulations to Barry Fletcher, ZS1FJ

The Multisource-ICOM Award is given to hams who have provided a major contribution to South African ham radio development, organizing DXpeditions, participating in various activities with the League, etc. The following "citation" comes from the South Africa Radio League (SARL) awards manager, Tjerk, ZS6P.

This arises from the ICOM (South Africa) award of the year to Barry P. Fletcher, ZS1FJ/ZL1MFW/G4MFW, etc. Barry is a long time member of the ARRL, CDXC, SARL, and recently of the Singapore Amateur Radio Society, as he is relocating permanently to Singapore. No exotic locations, but perhaps Pitcairn and Kermadec. Missionary emphasis also. Barry is a long serving member of the SARL in good standing. He has organized or participated in a large number of successful DXpeditions that have contributed significantly to the standing of

Barry Fletcher, ZS1FJ, recipient of the Multisource-ICOM Award. (Photo courtesy of Deon, ZS1ZL)

QSL Information

OD5UE via IZ8CCW
OD5UJ via YO3FRI
OE/DF6VI via DF6VI
OE2XCW/90KK via OE4RGC
OE2XRM/90KK via OE4RGC
OE5XAM/90KK via OE4RGC
OE5XCL/90KK via OE4RGC
OE7XBH/90KK via OE4RGC
OHØ/SK3SN via SM3KIF
OHØI/OJØ via OH3BHL
OH2K via OH2LRE
OH8HA via HA5UX
OJØYC via OH6GDX
OK6A via OK2KQM
OLØW via OK1DSZ
OL2U via OK1FMX
OL4WHC via OK1VSL
OM/HA5RT via HA6NL
OM4K via OM3KMK
OM500KM via OM2FY
ON4HAM via F6KWP
ON77KTK via ON5GK
OX/DL2SWW via DL2SWW
OX/DL2VFR via DL2VFR
OZ7VEA via DL7VEA
P29CC via KG6D
P29YS via VK6YS
P4/LY2CY via LY2CY
P4/LY2TA via LY2TA
P40L via K5WW
PJ2/AA6TT via NT1Y
PJ2W via WI9WI
PW3A via PY3CQ
PX2A via PY2EX
R200MIG via RV3LZ
R3ARS/P via RA3AKF
R9/DK2ZF via DK2ZF
RF3A via RK3AWE
RF4R via UA4RC
RIØIMA via UA3DX
RI9KM via UA4RC
RK3DZD/P via RD3DT
RK6YYA via RV6YZ
RMØM via UAØMF
RP3AIW via RZ3AXG
RP3DPR via RU3DI
RP3MGB via RK3MWI
RP3POT via RK3PWJ
RP3QQP via UA3OO
RP3WTW via RW3WWW
RP3XMV via UA3XAC
RP3ZES via RK3ZWK
RP3ZKB via RK3ZZ
RP3ZOR via RK3ZZM
RP6ADK via RK6AWY
RT3T via UA3TT
RU9G via RW3TN
RW9G via RW3TN
RZ8VWA via RUØUQ
S07PM via G3WQU
S5/OL3W via OL3W
S5040A via S50A
S5040R via S50R
S5041U via S51U
S5042LW via S52LW
S5043F via S54F
S5043S via S53S
S5044E via S54E
S5045A via S55A
S5046A via S56A
S5047L via S57L
S5047W via S57W
S5048A via S58A
S5048AL via S58AL
S5049N via S59N
S79DF via IV3TDM
S79RN via DK2ZF
S92SS via KY4P
S9SS via N4JR
SC6AG via SM6CTQ
SJ9WL via PP5ASN
SM3C via SM5CCT
SM7/DL1BBO via DL1BBO
SNØAG via SQ9GAH
SNØAIR via SP8KBZ
SNØAK via SQ7BCG
SNØAM via SP8KKM
SNØAPT via SP8YCB
SNØAQB via SP2AQB
SNØAU via SQ9DJD
SNØBAL via SP8ZIY
SNØBBL via SP8ZKX
SNØBG via SQ9FMO
SNØBK via SP2PTU
SNØBRD via SP2KJF
SNØBRO via SP2KJF
SNØBWG via SP8MI
SNØCAR via SP5MXI
SNØCEV via SP9PLR
SNØCFJ via SQ2CFJ
SNØCHJ via SP3LWP
SNØCUW via SP4YFG
SNØCUX via SQ4CUX
SNØCW via SP3KLZ
SNØDA via SP5ZHT
SNØDB via SP9QFL
SNØDD via SP4KIE
SNØDIG via SP5NHV
SNØDM via SP1KYB
SNØDMI via SQ2DMI
SNØDML via SQ2DML
SNØDYM via SP7PFD
SNØDZW via SP3HD
SNØEAP via SQ2EAP
SNØEEM via SP3KHJ
SNØEFU via SP2EFU
SNØKAL via SP3PKL
SNØR via SP2QCR
SN1LH via SP3VT
SN3KR via SP3VT
SN4EU via SP2QCU
SN5J via SP5JXK
SN6EU via SP6PCM
SN7Q via SP7GIQ
SNOLED via SP3OL
SO1CC via DL1CC
SO6Y via SP6CDP
SO8FH via PAØF
SPØDIG via SP5CJQ
SP3/DK2ZF via DK2ZF
SP3DIG via SP5CJQ
ST2DX via PA7FM
ST2T via S57DX
SVØXAO via DJ5JH
SV8/IKØREH/P via IKØREH
SV9/SV8DTL via SV8DTL
SX2004D via SV1DPI
SX2B via SV2BFL
SZ6P via SV1BJW
T28RW via ZL1AMO
T30AD via RK3AD
T30BH via ZL1AMO
T30C via F5CWU
T30KU via DL2AH
T30ND via K6ND
T30NN via AA4NN
T30OA via DL5OAB
T30RW via ZL1AMO
T30S via YZ7AA
T30TW via GM4FDM
T30ZF via DK2ZF
T33CA via K6SRZ
T33I via YT1AD
T33IC via DF2IC
T33LP via K3LP
T33ND via K6ND
T33OA via DL5OAB
T33S via YZ7AA
T33TW via GM4FDM
T44I via CO2WL
T88LV via JR1LVB
T88ZF via DK2ZF
T9/9A5AX via 9A5AX
TA3BN/Ø via TA3BN
TA3FB/Ø via TA3FB
TF/DL7BO/P via DL7UFR
TF/SM6CMU via SM6CMU
TF3IMD via TF3VS
TF3W via TF3IRA
TF7/LX9EG/M via LX1NO
TG7/OH3J via OH3OJ
TJ3SL via F5PSA
TK/DF6VU via DF6VU
TK/DL9YBY via DL9YBY
TK/F6AUS/P via F6AUS
TM5CC via F6KKH
TM5CJ via F6KJX
TM6BMC via F5IL
TM6J via F6KCZ
TM6JDD via F8KFE
TM6KKA via F6KKA
TM6O via F5SDH
TM6OCH via F6KFW
TM6OVS via F5RPB
TM6VER via F8IQS
TM7HAM via F6KWP
TM8N via F8DVD
TM8SOE via F8KKV
TM9CAI via F2KN
TM9GS via F8KKV
TO4A via VE3HO
TU2/F5PT via F5PTM
TU2OJ via F5IPW
TU5KG via F4EFI
TU8/F5LPY via F5LPY

(The table of QSL Managers is courtesy of John Shelton, K1XN, editor of "The Go List," 106 Dogwood Dr., Paris, TN 38242; phone 731-641-4354; e-mail: <golist@golist.net>.)

South African amateurs in the eyes of the world DX community. Barry has organized or participated in the following DXpeditions:

1993 Fiji, 3D2/G4MFW
1993 Tonga, A32/G4MFW
1994 Pitcairn, VP6AB
1994 Akamuru Island, FO/ZS1FJ, OC-063
1995 Kermadec, ZL8/G4MFW
1995 U.N. New York, 4U1UN
1996 Robben Island, ZS64RI, AF-064
1996 Seal Island, ZS23I, AF-077
1997 U.N. Geneva, 4U1ITU
1997 Liechtenstein, HBØ/G4MFW
1998 Bird Island, ZS26BI, AF-079
1998 St Pierre Miquelon, FP/G4MFW
1998 Great Barrier Island, ZL1MFW, OC-201
1998 Lesotho, 7P8FJ
1999 Stewart Island, ZL1MFW, OC-203
2000 Elephant Rock, ZS31ER, AF-085
2000 Botswana, A22DX
2001 St. Martin, FS/G4MFW
2002 Jersey, GJ4MFW
2003 Austral Islands, FO/G4MFW, OC-152
2003 Mangareva Island, FO/G4MFW/p, OC-063
2003 Tahiti/Windward, FO/G4MFW, OC-046
2003 Great Barrier Island, ZL1MFW, OC-201

As well as helping to activate almost all the coastal islands of South Africa, Barry has also organized many international expeditions and is well known and respected in the international DX community.

Barry is a world renowned DXer and has made the DXCC Honor Roll for working 332 countries. The only countries on the current DXCC list that he has not worked are Aves island YVØ, Andaman VU4, and VU7 Lakshadweep.

Barry has also contributed to the development of amateur radio amongst the youth of South Africa by sponsoring several generous annual DX awards for young amateurs who are members of the Cape Town Amateur Radio Centre. The awards that he sponsors include an all-expense-paid trip to the Radio Society of Great Britain conference in the United Kingdom.

The Multisource-Icom Excellence award is awarded "to amateurs who through their hobby have brought international recognition to South Africa." Barry has been an ambassador for South Africa through his achievements as a world-renowned DXer and his major contributions to numerous South African and international DXpeditions.—*73, Tjerk, ZS6P*

In Closing . . .

That's it for this month and 2004. Here's to peace, health, and happiness in the coming year . . . and lots of DX to work on the bands. 73, Carl, N4AA

Contesting

BY JOHN DORR,* K1AR

Contest Logging—On and Off the Air

December's Contest Tip

This one is an oldie but goodie. When operating most contests as an all-band participant, try to the work the highest open band as often as practical. Unfortunately, as the solar cycle continues to decline, that may prove to be 20 meters for most of the contest, but having a mental bookmark that gets you checking the "higher" frequencies will ensure you don't miss spot openings or needed multipliers. Also, as you're tuning 15 and 10 meters, keep that rotator turning. With marginal conditions, stations often arrive from beam headings different from the normal direct paths. Using this operating technique will improve your score no matter how small or big your station may be.

Calendar of Events

Nov. 20–21	LZ DX Contest
Nov. 20–21	RSGB 1.8 MHz CW Contest
Nov. 20–22	ARRL SSB Sweepstakes
Nov. 27–28	**CQ WW DX CW Contest**
Dec. 3–5	ARRL 160M Contest
Dec. 5	CIS DX Contest
Dec. 11–12	ARRL 10M Contest
Dec. 18	OK DX RTTY Contest
Dec. 18	RAC Winter Contest
Dec. 18–19	Stew Perry Topband Challenge
Jan. 8–9	ARRL RTTY Roundup
Jan. 8–9	North American CW QSO Party
Jan. 15–16	Hungarian DX Contest
Jan. 15–16	North American SSB QSO Party
Jan. 22–24	ARRL January VHF Sweepstakes
Jan. 29–30	**CQ WW 160M CW Contest**

A quick look at a set of contest rules should answer this month's topic for discussion. After all, most of us know that the CQ WW Contests end at 0000Z, ARRL Sweepstakes at 0300Z, ARRL Field Day at 1800Z (unless you're one of those crazy groups that starts building your station at the beginning of the contest), and so on. However, with the increased attention paid to logging accuracy in recent years, it seems reasonable for many to begin looking for the competitive edge that makes our "perfect" logs even more so. Or is it? This desire for perfection certainly has spawned some interesting debate over time.

So when do contests really end? Has a contest run its course when we power down our stations on Sunday evening? Many will argue that the contest is not really over until we have packaged up our Cabrillo log files and hit the send button on the computer. Although there are many views on this subject, they generally fall into two categories:

Position #1. The contest ends with the last QSO. The log may only be modified to identify unclaimed multipliers, time block errors (e.g., the entire log is off by 4 hours), and other "non-intrusive" actions.

Position #2. Although the "physical" time for the contest has expired, other methods may be employed to "sanitize" the log prior to submission, including callsign and exchange corrections, removal of questionable QSOs to avoid penalties, etc.

Many of the contesters I've spoken with recently agree that the "position #1" crowd probably has the smaller percentage of supporters. This is further substantiated by the input I received over the years in *CQ* Contest Surveys. In fact, based on generalized analysis, over 60% of the respondents clearly leaned toward "position #2."

Over the past few weeks, I've considered some of the known methods contesters use when choosing the second position. If you haven't thought about this issue in great depth, I guarantee you will now. What follows are just a few examples:

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e-mail: <K1AR@contesting.com>

• Record the entire contest and correct miscopied callsigns/exchanges.

• Manually scan through an entire log and remove/correct incorrectly copied callsigns/exchanges.

• Compare your log to another (same contest or previous one) and remove/correct potential errors.

• Compare your log to a computerized "master database" derived from other contests to remove/correct potential errors (either during or after the contest).

• Utilize computerized callsign lists (e.g., callbook listing, assigned FCC/foreign callsigns) to remove impossible callsign combinations.

When studying this topic, I uncovered more questions in my mind than answers. For example, if you utilize the aforementioned techniques, how should you use the new information? Is it fair to eliminate QSOs that retain high error potential? More important, is it even ethical to correct identified errors and take credit for QSOs that were invalid as originally logged?

I believe that contest sponsors have just begun to deal with this issue and, frankly, are somewhat befuddled as to what to do about it. Any measure of enforcing guidelines (if in fact that is even needed) quickly becomes impossible to administer. Can you imagine disqualifying someone's log for being too accurate? The resolution of this debate must remain with the individual contributor. It persists as a personal standard you wrestle with as you weigh your "real-time" operating ability against the pressures of winning.

Whether you massage your logs after the contest or not, there continues to be a growing trend that underlies this activity—a seemingly acceptable philosophy of someone not actually copying contest data during the contest. Here are just a few examples:

• Packet radio abuse, where callsigns/exchanges are logged simply based on what's on the computer screen and not on what is actually copied on the air.

• Increasing utilization of logging program data-

2003 CQ WW DX Contest Errata

The following are corrections/additions to the CQ WW SSB and CW results published in the August and September 2004 issues, respectively.

SSB

1. K4EA was mistakenly listed in the USA Top Scores box. He was Assisted 28 MHz.
2. PAØMIR was mistakenly listed in the World Top Scores box. His real Low Power 3.7 MHz score was 12,934.
3. OM3TB was Low Power 28 MHz.
4. The winner of the Single Operator Oceania 28 MHz Trophy was Joel Chalmers, KG6DX.
5. The World QRP SSB trophy is sponsored by Jeff Steinman, N5TJ.
6. The Multi-Two USA SSB trophy is sponsored by Kimo Chun, KH7U/KL7Y Memorial.

CW

1. W7DRA was a certificate winner in the Low Power 1.8 MHz category.
2. The winner of the Caribbean Single Band Trophy was ZF2AM operated by K6AM, not W5ASP as shown.
3. The operator at SP3BQ, winner of the European 1.8 MHz Trophy, was Bogdan Chorazyk, SP3RBR.
4. VE3JM with a score of 2,446,080 points should have been listed in Zone 4 in the Top Scores in Very Active Zones box.
5. RD3A was incorrectly listed as Multi-Single. He was Assisted 14 MHz and is a certificate winner.
6. GIØKOW was operated by Andrew Williamson, GIØNWG. His call and name should have appeared as the European 14 MHz trophy winner.
7. OK2PMS should have been listed as QRP 1.8 MHz, not All Band.
8. KZ2I should have been listed as KZ2I/4.
9. K9TTT should have been listed as K9TTT/8.

bases, not as an operator's tool, but as the defining adjudicator of a callsign whether copied on the air or not.

• Presumption from a previous QSO which included the caller's sending of the running station's callsign, of that station's callsign without actually copying it yourself.

Years ago, you may recall I wrote a column questioning whether or not technology in general and computers in particular were good for contesting. Clearly, the answer is a definitive "yes," but not without some cost. The convenience of computing has made all of our lives better, with one exception: We've stopped thinking for ourselves in many ways. The Internet has changed the science of primary investigation (and the way it's done). Spell checking (such as the kind I'm using right now) has reduced our ability to actually perform the art on our own. And yes, computerization of contesting has had its "dumbing down" impact as well.

Trust me when I say that I'm not advocating for a reduction in technology for contesting. Rather, whatever tools we use, I strongly believe we need to subscribe to two basic principles:

1. When the contest ends, it's over. Go massage your spouse's back, not your log.
2. When someone speaks to you and/or sends dots and dashes, it's for a reason. Copy them—all of them.

At the end of the day, contest operating is actually a pretty easy activity to learn and become proficient at doing. It's amazing when we compromise the basics, whether for competitive reasons or sheer laziness, how quickly we can go astray. The sport has survived 70+ years of activity because of the roots it's based upon, not the latest technology or angle to gain a few more points. That's a fact you can take to the bank!

Final Comments

Unfortunately, my work schedule got the best of me this month, so the 2004 *CQ* Contest Survey results will have to wait a bit. However, your responses are sitting in the "AR" cue awaiting analysis, so keep the faith!

That's it for this month. It's hard to believe another year is passing us by, but look at time from this perspective: With each passing day we'll be one day closer to the next solar peak. Depending on the delivery schedule of your magazine this month, I may be early for some and late for others, but the thought remains: May you and your family have a peaceful and joyous holiday season!

73, John, K1AR

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UG-21B/U	N Male RG-8 , 213, 214 Kings	5.00
9913/PIN	N Male Pin for 9913, 9086, 8214 Fits UG-21 D/U & UG-21 B/UN's	1.50
UG-21D/9913	N Male for RG-8 with 9913 Pin	4.00
UG-21B/9913	N Male for RG-8 with 9913 Pin	6.00
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UG-83B/U	N Female to PL-259, Teflon USA	7.50

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awards

BY TED MELINOSKY,* K1BV

RAC Awards Program

The national organization for amateur radio in Canada is the Radio Amateurs of Canada (RAC). It sponsors a handsome series of certificates, as described below. The date requirements vary and have been placed in the rules section of each award.

The latest addition to the series is the Worked RAC certificate for contacting Radio Amateurs of Canada officials using the special suffix "RAC," mostly during Canadian contests.

General Requirements: GCR (General Certification Rule) list accepted. Do not send QSL cards. Have them certified by two amateurs. Cards must be in the possession of the applicant. Sponsor may request random cards for checking. SWL okay. Apply to: Bill Metcalfe, VE6BF, 5704 48th Avenue, Beaumont, AB, T4X 1C3, Canada (e-mail: <ve6bf@rac.ca>; <http://www.rac.ca/opsinfo/awards.htm>). The application form is available upon request (SASE) or can be downloaded from the RAC website.

Canadaward: Confirm contact with each of the 13 Canadian provinces and territories on or after July 1, 1977. All QSOs must be on one band only. Separate awards for each band or mode. Fee is $US5 for stations outside of Canada, $C5 for Canadians.

*12 Wells Woods Rd., Columbia, CT 06237
e-mail: <k1bv@cq-amateur-radio.com>

USA-CA Special Honor Roll

John M. Hoyt, W5UGD
USA-CA All Counties #1103
September 30, 2004

USA-CA Honor Roll

500
K4IJQ 3318
F6HMJ.....3319
YBØAI.....3320
W5UGD....3321
DK1OU.....3322
W5UGD....1674
HA9RT 1675

1000
K6TV 1672
K6CA.....1673

1500
K6TV 1397
W5UGD....1398

2000
W5UGD....1294

2500
W5UGD....1215

3000
W5UGD....1124

The total number of counties for credit for the United States of America Counties Award is 3077. The basic award fee for subscribers is $6.00. For nonsubscribers it is $12.00. To qualify for the special subscriber rate, please send a recent CQ mailing label with your application. Initial application may be submitted in the USA-CA Record Book, which may be obtained from CQ Magazine, 25 Newbridge Road, Hicksville, NY 11801 USA for $2.50, or by a PC-printed computer listing which is in alphabetical order by state and county within the state. To be eligible for the USA-CA Award, applicants must comply with the rules of the program as set forth in the revised USA-CA Rules and Program dated June 1, 2000. A complete copy of the rules may be obtained by sending an SASE to Ted Melinosky, K1BV, 12 Wells Woods Road, Columbia, CT 06237 USA. DX stations must include extra postage for airmail reply.

Canadian Provincial Capitals Award: Work and confirm contacts with each of the ten provincial capital cities in Canada on or after 31 March 1949. They are: Edmonton (Alberta), Victoria (British Columbia), Fredericton (New Brunswick), St. John's (Newfoundland), Halifax (Nova Scotia), Winnipeg (Manitoba), Toronto (Ontario), Quebec City (Quebec), Charlottetown (PEI), and Regina (Saskatchewan). Fee is $US3/$C3.

Confirm contact with each of the 13 Canadian provinces and territories on or after July 1, 1977 to earn the Canadaward sponsored by the Radio Amateurs of Canada.

Work and confirm contacts with each of the ten provincial capital cities in Canada on or after 31 March 1949 to earn the Canadian Provincial Capitals Award.

Visit Our Web Site

The RAC Seaway Award is earned by working ten different stations along the route of the St. Lawrence Seaway after July 1950.

Seaway Award: Work ten different stations along the route of the St. Lawrence Seaway after July 1950. Of the ten contacts, one must be in each of the following areas: Thunder Bay, Greater Toronto, Greater Montreal, and Greater Quebec City. The remaining six may be from any municipality located along the route. Fee is $US3/$C3.

The Trans-Canada Award is awarded for working five stations in each of the ten Canadian provinces plus an additional five in the VO1 or VO2 area of Newfoundland and Labrador for a total of 55 contacts.

Trans-Canada Award: Work five stations in each of the ten Canadian provinces (see the 5 Band Canadaward below for the list of provinces; VE8 and VY1 and VYØ count as one area) plus an additional five in the VO1 or VO2 area of Newfoundland and Labrador for a total of 55 contacts. *Note:* Of the VE8 call area, at least one must be with a Yukon station (VE8 or VY1) and one must be with an offshore island of the Northwest Territories. Contacts since 1945 count for the award. Fee is $US3/$C3.

5 Band Canadaward: A special engraved plaque is available for stations that confirm contacts with the 12 provinces and territories on five amateur bands on or after July 1, 1977. All bands may be used. Each distinct satellite mode will count as a separate band. *Note:* VO2 Labrador is a part of the Province of Newfoundland and counts for Newfoundland. Some Canadian stations may be using different prefixes. Applicants should note that the award is based on the province or territory of residence of the QSL card, not the prefix. Fee is $US50/$C50.

Canadian Provinces and Territories: VO1– VO2 Newfoundland/Labrador; VE4 Manitoba; VE1 Nova Scotia; VE5 Saskatchewan; VE1/VE9 New Brunswick; VE6 Alberta; VY2/VE1 Prince Edward Island; VE7 British Columbia; VE2 Quebec; VE8 Northwest Territories; VE3 Ontario; VY1 Yukon; VYØ Nunavut.

Worked All RAC: Confirm two-way communications with an "official" RAC station using the suffix "RAC" with at least ten of the 18 available prefixes (VA1, VA2, VA3, VA4, VA5, VA6, VE1, VE4, VE5, VE6, VE7, VE8, VE9, VO1, VO2, VYØ, VY1, VY2) on or after 1 July 1998. With provinces or territories having two RAC calls—e.g., VA4 and VE4, VA1 and VE1, etc.—only *one* of the two count in the total of the *ten* required.

Note: QSL cards for the RAC official stations (all prefixes) should be sent to the call book address: Radio Amateurs of Canada, 217 - 720 Belfast Road,

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Separate Worked All RAC awards will be issued as follows:

Basic Award: Ten contacts, as stated above, on any band, any mode. Ten cards are required.

Endorsement: An endorsement is available to amateurs who supply proof of two-way contact with all 14 official RAC stations as listed. *Note:* When two calls are listed for a province or territory, either station will count but *not both*. The charge for the endorsement is $US1.00.

Single Band: Ten contacts, as stated above, on a single band, and the following modes: CW, SSB, RTTY, Mixed, SSTV, Satellite, other. Ten cards are required. Certificates are available for each band/mode. Cost of each certificate is $US5/$C5.

Worked RAC 5 Band Plaque: A special engraved plaque is available to any amateur who confirms two-way QSOs, as stated above, on five bands or more using the rule for single band, mode. A total of 50 cards is required. Cost of the plaque, without backboard, is $US20/$C20. With backboard cost is $US50/$C50. Cost is subject to change.

The TU-16 Badger Award

We've come a long way since the Cold War, when Russia and the U.S. faced one another with nuclear weapons capable of causing massive destruction. The TU-16 was a long-range Russian nuclear-capable bomber designed by A. N. Tupolev. The plane was produced in the town of Tupolev, Russia from 1953 to 1964. The NATO designation was "Badger." After the 1960s it was produced under license in China and was a part of several air forces of other countries until the early 1990s.

The TU-16 Badger Award is a reminder of the Cold War days, and the members of the Tupolev Radio Club extend an offer to their former foes to earn the certificate. It is available for contacts with the club station and members of the club, and for contacts with countries that used the aircraft. Contacts must have been made on or after 1 January 2004 . SWL okay. Earn 16

The TU-16 Badger Award, a reminder of the Cold War days and sponsored by the Tupolev Radio Club, is available for contacts with the club station and members of the club, and for contacts with countries that used the aircraft.

points for contacts using the following table of contact values:

Special event station UE3IAT = 10 points.

Club station RX3IXB = 6 points.

Members of the Tupolev Radio Club = 2 points.

QSO/SWL with any station in Egypt, Iraq, and Indonesia = 3 points.

QSO/SWL with any station in China = 4 points.

Any station operating from aeronautical mobile = 6 points.

Special requirement: At least one contact/SWL must be with a member of the Tupolev Radio Club. All bands and modes may be used. All contacts must be with different calls. No use of repeaters. Portable/mobile, etc., contacts are okay.

Send GCR list and fee of $US5 to: Andrey Shepetov, P.O. Box 59, Tverskaya obl, Kimry, Russia (e-mail: <rk3ixb@front.ru>; on the web: <http://rk3ixb.sbn.bz>).

Members of the Tupolev Radio Club: R3AR, UA; RA1OHD, TDD; RA3IAH, ICB, TC; RK3DAE, DAQ, ZE; RK9JXO; RV3DDL, DHJ, DUA; RX6LGR; U3WH; UA3AGY, DBR, IDD, IES, IET, IEU, IFX, IHC, IUE, IVO, IVQ, IVS, IZZ, URF; UA9SGQ.

(Thanks to Andre, RA1AE, for this award information.)

In Closing

I want to wish you and yours a safe, peaceful, and happy holiday season, and all the best in the new year.

Please remember to send along information about your group or club's awards program so we can give it the publicity it needs to be successful.

73, Ted, K1BV

Nelda Smith, W6XJN
USA-CA All Counties #1100

This month we hear from Nelda Smith, W6XJN, who received USA-CA All Counties #1100, Mixed, July 15, 2004.

When my husband Cliff, K6JN, became a county hunter in 1998, I decided that as a Christmas gift to him I would upgrade my license to General so we could run counties as a team. I thought it looked like a fun thing we could do together. I studied the Code Quick tapes, and when I went to take the 5-wpm code test, I surprised everyone, including myself,, when I passed the General code requirement. I then studied for and passed the written test for General. We have been running as a team ever since on our many trips across the U.S.

I always say that county hunting has taken us many places we never would have seen if not for this hobby. I can remember shady spots on a bayou in Louisiana, cotton fields and oil patches in Texas, and even an Indian reservation in New Mexico, where any second I expected to see a herd of buffalo come up over the rise. A am a novice birdwatcher, so I always have my binoculars and bird book handy on our travels.

Our two boys grew up in the little mountain town of Wrightwood, California, where we spend our summers now. I was on our local school board for many years and worked as a volunteer for 4-H, the local school, and the band. I always had a vegetable garden until this year, when we have a water shortage. We enjoy visiting our two

Nelda Smith, W6XJN, USA-CA All Counties #1100 Mixed, July 15, 2004.

grandchildren, and I know Cliff will try his best to make them into hams.

In the winter months we spend our time in Tavares, Florida, where we have a home on Lake Dora and our two radio rooms look out over it. I like to go to estate and yard sales, so my vehicle antenna has to be low enough so that it doesn't get caught in the canopy of trees.

I really enjoyed working all the counties, and I thank all the mobiles for putting them out and returning my MRCs (Mobile Reply Cards). I also thank Jim, KZ2P, and the other net controls for all those relays, and Cliff, K6JN, for being my information manager. *—73, Nelda, W6XJN*

Cycle 23 May End Earlier Than Predicted

BY TOMAS HOOD,* NW7US

A Quick Look at Current Cycle 23 Conditions
(Data is rounded to nearest whole number)

Sunspots
Observed Monthly, September 2004: 28
Twelve-month smoothed, March 2004: 47

10.7 cm Flux
Observed Monthly,September 2004: 103
Twelve-month smoothed, March 2004: 115

***Ap* Index**
Observed Monthly,September 2004: 10
Twelve-month smoothed, March 2004: 17

On October 10 and 11, 2004 observers of the sun were unable to find any sunspots. This also happened on January 28, 2004, the first time since the start of this current cycle.

This recent "non" activity indicates that we are getting close to the period in this cycle of minimum activity. This "solar cycle minimum" marks the end of the cycle, and the start of the next. Based on the timing of these days with no sunspots, some are speculating that the cycle may end earlier than was anticipated. Most have forecast an end to the cycle sometime in 2007. Perhaps with this recent behavior we'll see the cycle ending in 2006, or even in 2005.

This is welcome news for Top band enthusiasts, who look for low solar activity with low geomagnetic disturbances, and a quiet winter season. This year we should see a vast improvement on the low HF and MF bands.

Sunspots are magnetic regions on the sun with magnetic-field strengths thousands of times stronger than the Earth's magnetic field. Plasma flows in these magnetic-field lines of the sun. Sunspots appear as dark spots on the surface of the sun. Temperatures in the dark centers of sunspots (the *umbra*) drop to about 3700K, compared to 5700K for the surrounding photosphere. This difference in temperature makes the spots appear darker than elsewhere. Sunspots typically last for several days, although very large ones may live for several weeks. They are seen to rotate around the sun, since they are on the surface, and the sun rotates fully every 27.5 days.

Sunspots usually form in groups containing two sets of spots. One set will have a positive, or north, magnetic field, while the other set will have a negative, or south, magnetic field. The magnetic field is strongest in the darker parts of the sunspot. The field is weaker and more horizontal in the lighter part (the *penumbra*).

Galileo Galilea made the first European observations of sunspots in 1610. The Chinese and many other early civilizations have records of sunspots dating even earlier. Daily sunspot observations were started at the Zurich Observatory in 1749. By 1849, continuous sunspot observations were recorded.

*P.O. Box 213, Brinnon, WA 98320-0213
e-mail: <cq-prop-man@hfradio.org>

LAST-MINUTE FORECAST

Day-to-Day Conditions Expected for December 2004

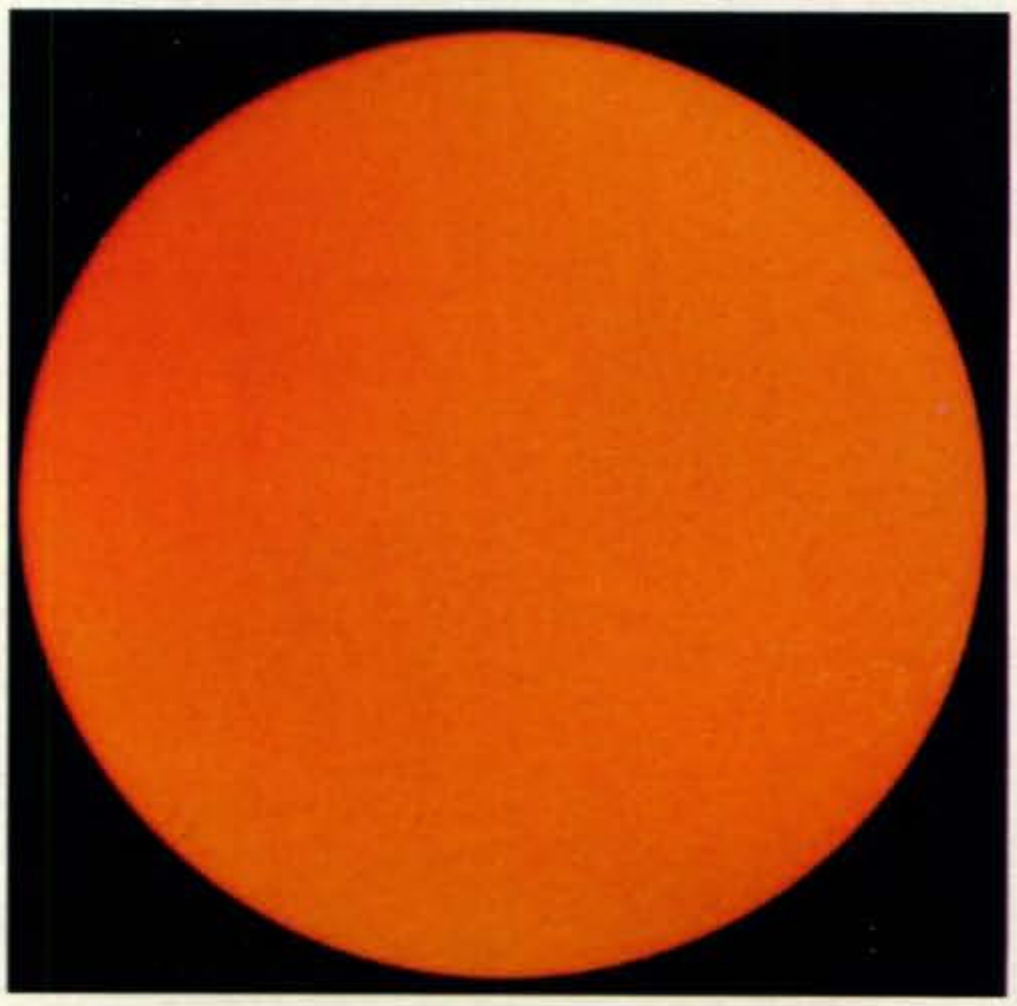
	Expected Signal Quality			
Propagation Index.....	(4)	(3)	(2)	(1)
Above Normal: 1-3, 10-11, 15-18, 20-22, 26-30	A	A	B	C
High Normal: 4-6, 9, 12, 14, 19, 23, 25, 31	A	B	C	C-D
Low Normal: 13, 24	B	C-B	C-D	D-E
Below Normal: 8	C	C-D	D-E	E
Disturbed: 7	C-D	D	E	E

Where expected signal quality is:
A—Excellent opening, exceptionally strong, steady signals greater than S9.
B—Good opening, moderately strong signals varying between S6 and S9, with little fading or noise.
C—Fair opening, signals between moderately strong and weak, varying between S3 and S6, with some fading and noise.
D—Poor opening, with weak signals varying between S1 and S3, with considerable fading and noise.
E—No opening expected.

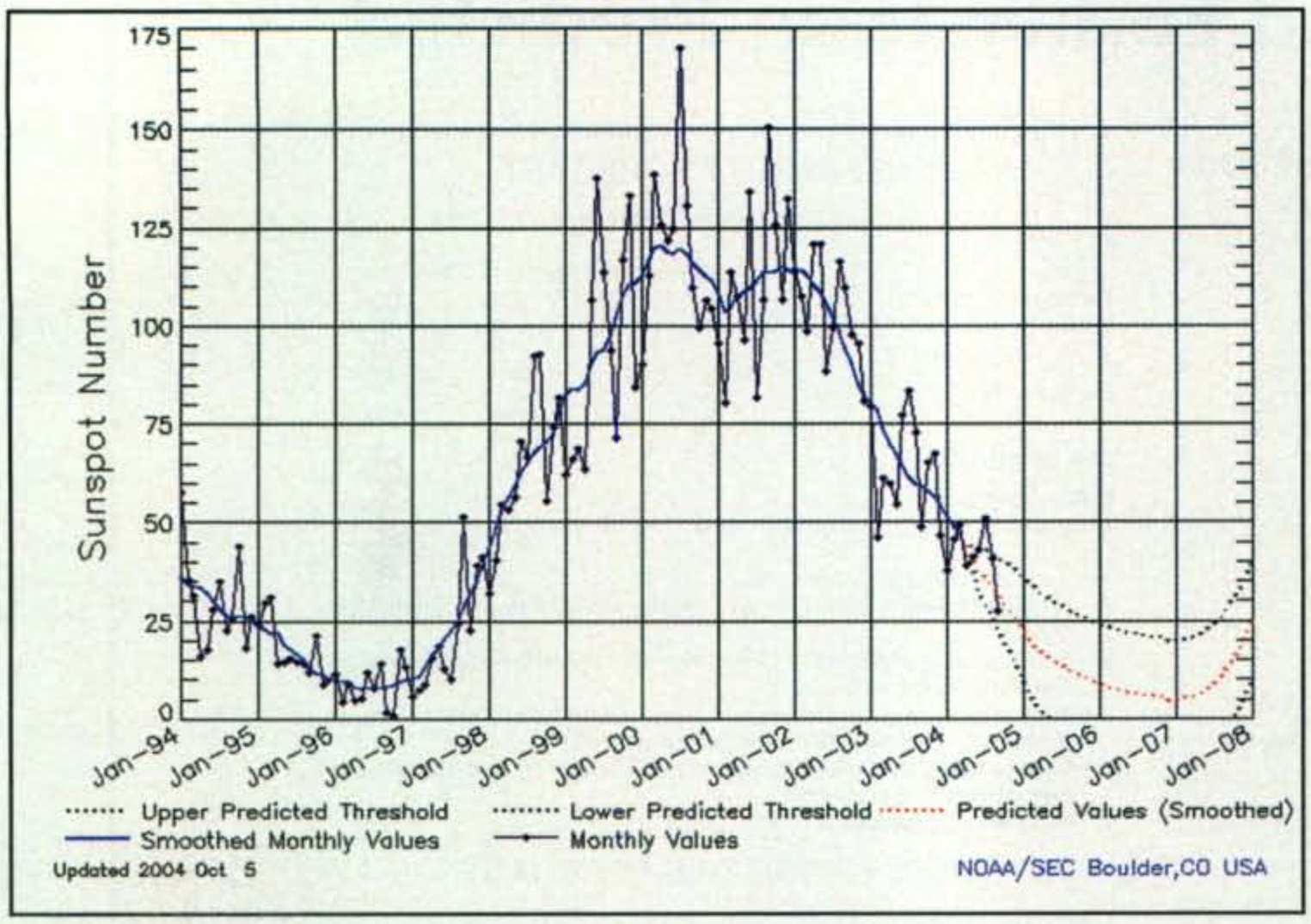
HOW TO USE THIS FORECAST

1. Find the *propagation index* associated with the particular path opening from the Propagation Charts appearing on the following pages.
2. With the *propagation index*, use the above table to find the expected signal quality associated with the path opening for any given day of the month. For example, an opening shown in the Propagation Charts with a *propagation index* of 3 will be excellent (A) on Dec. 1–3, good (B) on the 4–6, fair to poor (C-D) on the 7th, etc.

The sunspot number is calculated by first counting the number of sunspot groups and then the number of individual sunspots. The "sunspot number" is then given by the sum of the number of individual sunspots and ten times the number of groups. Since most sunspot groups have, on average, about ten spots, this formula for counting sunspots gives reliable numbers even when the observing conditions



No sunspots! This is an image of the sun from October 11, 2004, showing no sunspots. This is the second such occurrence of a zero-sunspot day since the start of this cycle. The last was during the first part of 2004. This shows a clear decline in the cycle, and some speculate it indicates a possible early arrival of the cycle's end. (Courtesy of SOHO)



Solar Cycle 23 sunspot number progression through September 2004. As can be seen, the cycle is moving quickly now toward the solar cycle minimum, expected sometime between 2006 and 2007. (Courtesy of the NOAA/Space Environment Center)

are less than ideal and small spots are hard to see. Monthly averages (updated monthly) of the sunspot numbers show that the number of sunspots visible on the sun waxes and wanes with an approximate 11-year cycle.

Sunspot numbers give us a way to measure the sun's overall activity. The more active the sun, the higher the sunspot count. Scientists have studied the correlation between the sun's activity and the resulting events (such as a solar flare, or a coronal mass ejection [CME]), and our ionosphere and geomagnetic field activities. The sun directly influences the Earth's environment. By keeping close record of the sunspot number and the overall propagation conditions, scientists have developed models that help us forecast HF openings on any given path.

December Propagation

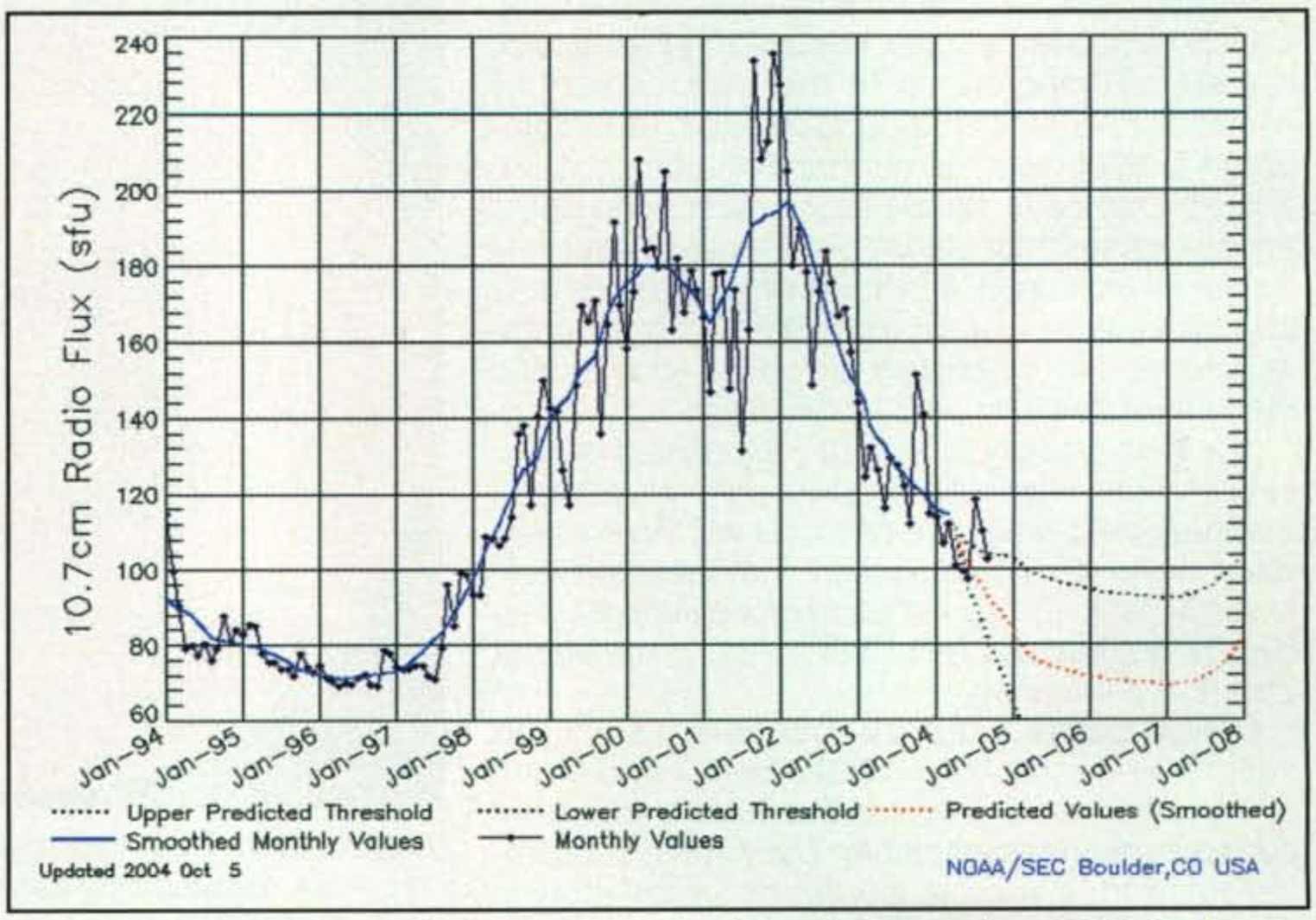
A moderate to low level of solar activity is expected during December. The density of ionization in the Northern Hemisphere is expected to increase more rapidly after sunrise than during other seasons. Static and atmospheric noise levels will be at seasonally low values during the month. Reasonably strong signal levels are expected on most of the open bands, while the higher bands will not be as hot as during the peak years.

Continue to expect fair daytime openings on 10, 12, and 15 meters, with the stronger being on 15. Openings will be shorter than the same time last year due to the lower solar activity, but these should still hold promise for paths into many parts of the world. Ten meters showed good performance as early as the end of September, but especially during October. This will continue as we enter into winter.

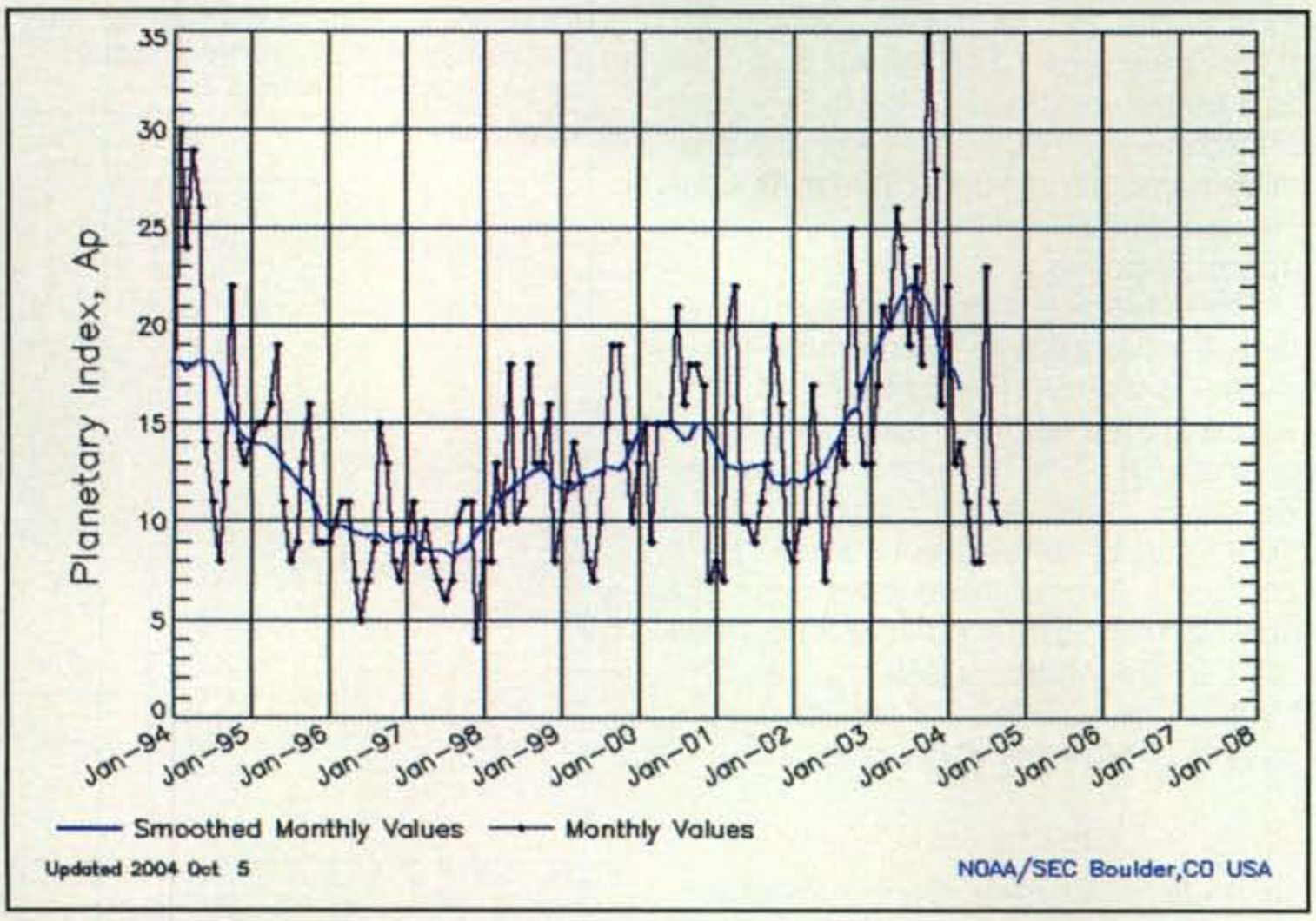
Ten- and 12-meter DX openings should be possible during much of the daylight hours, especially where the propagation paths cross the sunlit regions. Fairly good DX openings are also expected on 17 and 15 meters, remaining open towards the west during the early evening. However, 20 meters will be the hottest of all daytime bands, starting with early morning openings in all directions until about an hour or two after sunrise, and then remaining open into one place or another through the day until early evening. Thirty meters will be a strong player for DXing, as well, following the pattern of 20 meters. When conditions are Above Normal, 30, 20, and 17 meters are likely to remain open towards the south and west from early evening until about midnight, especially for DXers in the lower latitudes.

On 40 meters, regional daytime openings will remain strong for most of the day, while great DX will open early in the afternoon. From midnight to sunrise, 40 promises some of the hottest nighttime DX during December. The first DX openings should be toward Europe and the east during the late afternoon, then move across the south through the hours of darkness, while remaining open into most parts of the world. Just after sunrise, openings will be more in a westerly direction. Low seasonal noise will make DXing a pleasurable endeavor.

DX openings on 160 and 80 meters during the hours of darkness and into the sunrise period, with considerably decreased static levels, are a sure bet during the longer hours of darkness in



The Cycle 23 10.7-cm radio flux progression through September 2004. Notice the second, very pronounced second peak during the middle of this current cycle. We are now seeing quite a reduction in solar activity since the peak. (Courtesy of the NOAA/Space Environment Center)



As can be seen in the solar cycle Ap progression for Cycle 23, we saw a very high amount of geomagnetic activity during the decline of this cycle. It is now expected to quiet down quite a bit as we approach the cycle minimum. (Courtesy of the NOAA/Space Environment Center)

the northern latitudes. Look for openings toward Europe and the south from the eastern half of the United States and towards the south, the Far East, Australasia, and the South Pacific from the western half of the country. Eighty meters becomes a reliable long-distance band throughout the entire period of darkness during December. Openings on 80 should peak towards Europe and in a generally easterly direction around midnight, then open in a generally western direction with a peak just after sunrise. The band should remain open toward the south throughout most of the night.

Overall, expect fair DX conditions on the higher bands on and above 15 meters, with good DX openings on 15 through 20 meters during most of the daylight hours. As night falls, move to 30, 40, and 80 meters for openings all over the DX world.

For short-skip openings during December, try 80 and 40 meters during the day for paths less than 250 miles, and 80 or 160 meters at night for these distances. For openings between 250 and 750 miles, try 40 meters during the day, and both 80 and 160 at night. For distances between 750 and 1300 miles, 20 and 30 meters should provide daytime openings, while 40 and 80 will be open for these distances from sunset to midnight. After midnight, 80 meters will remain open out to 1300 miles until sunrise. Try 30 and 40 meters again for about an hour or so after sunrise. For openings between 1300 and 2300 miles, openings will occur on 20, 17, and 15 meters, with fewer on 12 and 10 meters, during the daylight hours. During sundown to midnight, check 20, 30, and 40 meters for these long-distance openings, and then check 40 and 80 meters after midnight until sunrise. Try 40 meters again for an hour or so after sunrise.

VHF Conditions

While there might be an occasional geomagnetic disturbance due to coronal-hole activity, aurora will most likely not occur this month. If there were any chance at all, you'll want to look for days with conditions at Disturbed or Below Normal, when there is a possibility for Field Aligned Irregularities (FAI) and auroral-*E* propagation. Check the Last-Minute Forecast at the beginning of this column for those days during December that are expected to be in these categories.

A slight increase in sporadic-*E* propagation is possible on both 6 and 2 meters during this month. This statistically occurs during the last part of December and early in January.

Look for some decent meteor shower activity this month, providing conditions for meteor-scatter openings on the VHF bands for distances up to about 1000 miles.

Meteor-scatter propagation is a mode where radio signals are refracted off the ionized plasma trails left by dust and small particles that have entered into our atmosphere at thousands of miles per hour. The ionized trail is produced by vaporization of the meteor. Meteors no larger than a pea can produce ionized trails up to 12 miles in length in the *E*-layer of the ionosphere. Because of the height of these plasma trains, the range of a meteor-scatter contact is between 500 and 1300 miles. The frequencies that are best refracted are between 30 and 100 MHz. However, with the development of new software and techniques, frequencies up to 440 MHz have been used to make successful radio contacts off these meteor trains. On the lower frequencies, such as on 6 meters, contacts may last from mere seconds to well over a minute. The lower the frequency, the longer the specific opening made by a single meteor train. A meteor train that supports a 60-second refraction on 6 meters might only support a one-second refraction for a 2-meter signal. Special high-speed methods are used on these higher frequencies to take advantage of the limited available time.

A great introduction by Shelby, W8WN, on working high-speed CW meteor scatter is found at <http://www.amt.org/Meteor_Scatter/shelbys_welcome.htm>. Links to various groups, resources, and software are found at <http://www.amt.org/Meteor_Scatter/default.htm>.

The annual *Geminids* meteor shower will peak on the night of December 13 at 2220 UTC. This is one of the bet-

CQ WW DX CW Contest Forecast Looks Great!

Since this issue of *CQ* might reach subscribers prior to the start of the CQ World-Wide DX CW Contest weekend of November 27–28, here is an updated forecast made at press time for the general propagation conditions expected.

Based on the 27-day recurrence tendencies of solar and geomagnetic conditions, it looks like conditions will be excellent on both contest days. Expect Above Normal HF conditions for the both days.

Daily 10.7cm solar flux levels are expected to be around 90 during the contest weekend. The geomagnetic planetary *A*-index is expected to be between 5 and 10 during the CW contest.

There are no major storms expected for the weekend, so propagation conditions during this year's CW contest should be good. To maximize scores, be sure to plan your operation based upon the details covered in last month's column.

ter showers, since as many as 120 visual meteors per hour may occur. The *Geminids* is a great shower for those trying the meteor-scatter mode of propagation, since one doesn't have to wait until after midnight to catch this shower. The radiant rises early, but the best viewing and operating time will be after midnight local time. This shower also boasts a broad maximum, lasting nearly one whole day, so no matter where you live, you stand a decent chance of catching sight of some of the *Geminids*.

While mostly a Southern Hemisphere event, another shower is the *Phoenicids*, active between November 28 and December 9, peaking December 6 at 0235 UTC. If we get a higher rate than the expected three or less, this could be a fun shower to try. Only one impressive *Phoenicid* shower has been reported, and that was the year of its discovery, in 1956, when the hourly rate was 100. This may be a periodic shower however, and VHF meteor-scatter operators need more observations of it. However, based on past experience, you might meet with difficulties even if there is a higher rate. Radar echoes from the 1956 event were only 30 per hour. This might be due to these low-velocity meteors producing too little radio-reflecting ionization.

There is considerably less likelihood for 6-meter trans-equatorial (TE) openings during December, but look for a possible opening between the southern states and locations deep in South America. The best time to look for these is between about 8 and 11 PM local time.

Check out <http://www.imo.net/calendar/cal04.html> for a complete calendar of meteor showers in 2004.

Current Solar Cycle Progress

The Royal Observatory of Belgium reports that the monthly mean observed sunspot number for September 2004 is 28, a very large drop from August's 41, and lower than any month during the current Cycle 23. The last time we saw a monthly mean in the 20s was in October 1997, seven years ago, with 22.8. The lowest daily sunspot value during September was recorded on September 1, 2, and 28, with a count of 8. The highest daily sunspot count was 51 on September 9. The 12-month running smoothed sunspot number centered on March 2004 is 47, two points down from February. A smoothed sunspot count of 26 is expected for December 2004, give or take about 12 points.

The Dominion Radio Astrophysical Observatory at Penticton, BC, Canada, reports a 10.7-cm observed monthly mean solar flux of 103 for September 2004, down from 110 for August. The 12-month smoothed 10.7-cm flux centered on March 2004 is 114.6. The predicted smoothed 10.7-cm solar flux for December 2004 is about 87, give or take about 16 points.

The observed monthly mean planetary *A*-Index (*Ap*) for September 2004 is 10, down from September's 11 (this was adjusted up from last month's report of 10). The 12-month smoothed *Ap*-index centered on March 2004 is 16.9, about one point down from February. Expect the overall geomagnetic activity to be quiet during most days in December. Refer to the Last-Minute Forecast for the outlook on the days on which this might occur.

What's Coming Next Month?

Next time I will be exploring PropNET, an automated and well-organized beacon effort on 10 meters and above. Much like BeaconNET, which uses additional HF bands, PropNET gathers beacon data using computers, and helps not only in discovery of openings, but has helped discover details about propagation modes. "Tune in" next month as we delve into modern propagation studies using computers, sound cards, and amateur radio.

HOW TO USE THE DX PROPAGATION CHARTS

1. Use chart appropriate to your transmitter location. The Eastern USA Chart can be used in the 1, 2, 3, 4, 8, KP4, KG4, and KV4 areas in the USA and adjacent call areas in Canada; the Central USA Chart in the 5, 9, and 0 areas; the Western USA Chart in the 6 and 7 areas; and with somewhat less accuracy in the KH6 and KL7 areas.

2. The predicted times of openings are found under the appropriate meter band column (10 through 80 meters) for a particular DX region, as shown in the left-hand column of the charts. An * indicates the best time to listen for 160 meter openings. An ** indicates best time to check for 6 meter openings.

3. The propagation index is the number that appears in ( ) after the time of each predicted opening. The index indicates the number of days during the month on which the opening is expected to take place as follows:

(4) Opening should occur on more than 22 days
(3) Opening should occur between 14 and 22 days
(2) Opening should occur between 7 and 13 days
(1) Opening should occur on less than 7 days

Refer to the "Last Minute Forecast" at the beginning of this column for the actual dates on which an opening with a specific *propagation index* is likely to occur, and the signal quality that can be expected.

4. Times shown in the charts are in the 24-hour system, where 00 is midnight; 12 is noon; 01 is 1 A.M.; 13 is 1 P.M., etc. Appropriate *standard* time is used, not GMT. To convert to GMT, add to the times shown in the appropriate chart 8 hours in PST Zone, 7 hours in MST Zone, 6 hours in CST Zone, and 5 hours in EST Zone. For example, 13 hours in Washington, D.C. is 18 GMT. When it is 20 hours in Los Angeles, it is 04 GMT, etc.

5. The charts are based upon a transmitted power of 250 watts CW, or 1 kw, PEP on sideband, into a dipole antenna a quarter-wavelength above ground on 160 and 80 meters, and a half-wavelength above ground on 40 and 20 meters, and a wavelength above ground on 15 and 10 meters. For each 10 dB gain above these reference levels, the *propagation index* will increase by one level; for each 10 dB loss, it will lower by one level.

6. Propagation data contained in the charts has been prepared from basic data published by the Institute for Telecommunication Sciences of the U.S. Dept of Commerce, Boulder, Colorado 80302.

December 15, 2004 - February 15, 2005
Time Zone: EST (24-Hour Time)
EASTERN USA To:

Reception Area	*10/15 Meters*	*20 Meters*	*40 Meters*	*80 Meters*
Western & Central Europe & North Africa	09-11 (1)** 08-09 (1) 09-11 (2) 11-12 (1)	06-07 (1) 07-08 (2) 08-10 (3) 10-12 (4) 12-13 (3) 13-14 (2) 14-15 (1)	15-16 (1) 16-17 (2) 17-19 (3) 19-01 (2) 01-03 (3) 03-04 (2) 04-05 (1)	17-19 (1) 19-20 (2) 20-02 (3) 02-03 (2) 03-04 (1) 20-00 (1)* 00-02 (2)* 02-03 (1)*
Northern Europe & European CIS	08-10 (1)	06-07 (1) 07-11 (2) 11-12 (1)	15-17 (1) 17-19 (2) 19-01 (1) 01-02 (2) 02-03 (1)	17-19 (1) 19-01 (2) 01-03 (1) 21-00 (1)*
Eastern Mediterranean & Middle East	08-09 (1) 09-10 (2) 10-11 (1)	07-08 (1) 08-10 (2) 10-12 (3) 12-14 (2) 14-15 (1)	17-19 (1) 19-21 (2) 21-00 (1) 00-01 (2) 01-02 (1)	18-20 (1) 20-22 (2) 22-00 (1) 20-22 (1)*
Western Africa	10-12 (1)** 08-09 (1) 09-11 (2) 11-13 (3) 13-14 (2) 14-15 (1)	06-07 (1) 07-09 (2) 09-12 (1) 12-14 (2) 14-16 (3) 16-17 (2) 17-18 (1)	18-20 (1) 20-23 (2) 23-02 (1) 02-03 (2) 03-04 (1)	19-22 (1) 22-01 (2) 01-03 (1) 22-01 (1)*
Eastern & Central Africa	08-11 (1) 11-13 (2) 13-14 (1)	07-13 (1) 13-16 (2) 16-18 (1)	18-20 (1) 20-23 (2) 23-01 (1)	19-00 (1)
Southern Africa	10-13 (1)** 08-09 (1) 09-11 (2) 11-13 (3) 13-14 (2) 14-15 (1)	07-09 (1) 12-14 (1) 14-15 (2) 15-16 (3) 16-17 (2) 17-19 (1)	18-20 (1) 20-22 (1) 22-00 (1) 22-00 (1)	19-22 (1)
Central & South Asia	16-18 (1)	07-10 (1) 19-21 (1)	06-08 (1) 18-22 (1)	06-07 (1) 18-20 (1)
Southeast Asia	16-18 (1)	07-10 (1) 17-20 (1)	06-08 (1) 18-21 (1)	06-07 (1) 18-20 (1)
Far East	16-18 (1)	06-07 (1) 07-09 (2) 09-11 (1) 15-17 (1) 17-19 (2) 19-21 (1)	05-08 (1) 17-18 (1)	05-08 (1) 17-18 (1)
South Pacific & New Zealand	13-15 (1)** 12-14 (1) 14-17 (2) 17-18 (1)	05-07 (1) 07-10 (2) 10-18 (1) 18-20 (2) 20-22 (1)	01-02 (1) 02-04 (2) 04-07 (3) 07-08 (2) 08-09 (1)	04-05 (1) 05-07 (2) 07-08 (1) 04-07 (1)*
Australasia	14-16 (1)** 12-15 (1) 15-17 (2) 17-18 (1)	06-07 (1) 07-10 (2) 10-12 (1) 15-16 (1) 16-19 (2) 19-21 (1)	03-05 (1) 05-08 (2) 08-09 (1) 17-19 (1)	05-06 (1) 06-07 (2) 07-08 (1) 17-18 (1) 05-07 (1)*
Caribbean, Central America & Northern Countries of South America	10-15 (1)* 08-09 (1) 09-12 (2) 12-16 (3) 16-17 (2) 17-18 (1)	06-07 (1) 07-08 (3) 08-09 (4) 09-11 (3) 11-15 (2) 15-17 (3) 17-18 (4) 18-19 (2) 19-20 (1) 01-03 (1)	17-18 (1) 18-19 (2) 19-21 (3) 21-03 (2) 03-06 (3) 06-07 (2) 07-08 (1)	18-20 (1) 20-21 (2) 21-04 (3) 04-06 (2) 06-07 (1) 21-03 (1)* 03-05 (2)* 05-06 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	11-15 (1)** 08-09 (1) 09-11 (2) 11-13 (1) 13-14 (2) 14-15 (3) 15-16 (2) 16-17 (1)	06-07 (1) 07-09 (2) 09-10 (1) 12-14 (1) 14-15 (2) 15-16 (3) 16-17 (4) 17-18 (3) 18-19 (2) 19-20 (1) 22-00 (1)	19-21 (1) 21-02 (2) 02-05 (1) 05-06 (2) 06-07 (1)	21-03 (1) 03-05 (2) 05-06 (1) 03-05 (1)*
McMurdo Sound, Antarctica	15-17 (1)	07-09 (1) 17-18 (1) 18-20 (2) 20-22 (1) 22-00 (2) 00-02 (1)	22-00 (1) 00-02 (2) 02-06 (1)	*Nil*

Time Zones: CST & MST
(24-Hour Time)
CENTRAL USA To:

Reception Area	*10/15 Meters*	*20 Meters*	*40 Meters*	*80 Meters*
Western & Southern Europe & North Africa	09-11 (1)	06-08 (1) 08-10 (2) 10-12 (3) 12-13 (2) 13-15 (1)	15-17 (1) 17-19 (2) 19-22 (3) 23-01 (2) 01-02 (1)	17-19 (1) 19-00 (2) 00-01 (1) 20-01 (1)*

Visit Our Web Site

Northern & Central Europe & European CIS	08-11 (1)	07-08 (1) 08-11 (2) 11-12 (1)	16-18 (1) 18-19 (2) 19-22 (1) 22-00 (2) 00-01 (1)	18-00 (1) 20-00 (1)*
Eastern Mediter-ranean & Middle East	08-11 (1)	07-09 (1) 09-12 (2) 12-14 (1) 22-00 (1)	17-19 (1) 19-22 (2) 22-23 (1)	19-22 (1)
West Africa	09-12 (1)** 08-09 (1) 09-11 (2) 11-13 (3) 13-14 (2) 14-15 (1)	06-07 (1) 07-09 (2) 09-11 (2) 11-13 (2) 13-15 (3) 15-16 (2) 16-18 (1)	17-20 (1) 20-23 (2) 23-01 (1)	19-22 (1) 22-23 (2) 23-00 (1) 21-23 (1)*
Eastern & Central Africa	09-12 (1)	07-12 (1) 12-14 (2) 14-16 (3) 16-17 (1)	18-19 (1) 19-21 (2) 21-23 (1)	19-22 (1)
Southern Africa	10-12 (1)** 08-10 (1) 10-13 (2) 13-14 (1)	07-13 (1) 13-15 (2) 15-16 (3) 16-17 (2) 17-18 (1) 22-00 (1)	18-19 (1) 19-21 (2) 21-23 (1)	19-22 (1)
Central & South Asia	17-19 (1)	07-10 (1) 19-21 (1)	06-08 (1) 18-21 (1)	06-07 (1) 18-20 (1)
Southeast Asia	17-19 (1)	06-07 (1) 07-09 (2) 09-12 (1) 17-20 (1)	06-08 (1) 17-19 (1)	06-07 (1) 17-19 (1)
Far East	17-19 (1)	06-07 (1) 07-09 (2) 09-11 (1) 15-17 (1) 17-19 (2) 19-20 (1)	01-03 (1) 03-07 (2) 07-08 (1)	02-04 (1) 04-06 (2) 06-07 (1) 04-06 (1)*
South Pacific & New Zealand	12-16 (1)** 11-13 (1) 13-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	06-07 (1) 07-11 (2) 11-16 (1) 16-17 (2) 17-19 (3) 19-20 (2) 20-21 (1)	23-01 (1) 01-02 (2) 02-06 (3) 06-07 (2) 07-09 (1)	00-01 (1) 01-06 (2) 06-08 (1) 03-07 (1)*
Austral-Asia	14-17 (1)** 11-15 (1) 15-17 (2) 17-18 (1)	07-08 (1) 08-11 (2) 11-18 (1) 18-20 (2) 20-21 (1)	01-03 (1) 03-07 (3) 07-08 (2) 08-09 (1)	03-05 (1) 05-07 (2) 07-08 (1) 04-07 (1)*
Caribbean, Central America & Northern Countries of South America	10-15 (1)** 08-09 (1) 09-10 (2) 10-13 (3) 13-15 (4) 15-16 (3) 16-17 (1)	06-07 (1) 07-10 (3) 10-14 (2) 14-16 (3) 16-17 (4) 17-18 (3) 18-19 (2) 19-21 (1) 23-01 (1)	18-20 (1) 20-22 (2) 22-00 (3) 00-04 (2) 04-06 (3) 06-07 (1)	19-21 (1) 21-05 (2) 05-06 (1) 23-05 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	11-15 (1)* 08-09 (1) 09-11 (2) 11-13 (1) 13-14 (2) 14-15 (3) 15-16 (2) 16-17 (1)	06-07 (1) 07-09 (2) 09-13 (1) 13-14 (2) 14-15 (3) 15-17 (4) 17-18 (3) 18-19 (2) 19-20 (1) 22-00 (1)	19-21 (1) 21-02 (2) 02-04 (1) 04-06 (2) 06-07 (1)	21-05 (1) 00-04 (1)*
McMurdo Sound, Antarctica	15-17 (1)	07-08 (1) 08-09 (2) 09-11 (1) 17-18 (1) 18-20 (2) 20-22 (1) 22-00 (2) 00-01 (1)	22-00 (1) 00-02 (2) 02-06 (1)	*Nil*

Time Zone: PST
(24-Hour Time)
WESTERN USA To:

Reception Area	*10/15 Meters*	*20 Meters*	*40 Meters*	*80 Meters*
Western & Southern Europe & North Africa	08-01 (1)	06-07 (1) 07-11 (2) 11-13 (1) 23-01 (1)	17-21 (1) 21-23 (2) 23-01 (1)	18-20 (1) 20-22 (2) 22-23 (1) 19-22 (1)*
Northern Europe & European CIS	08-10 (1)	06-07 (1) 07-11 (2) 11-13 (1) 23-01 (1)	17-00 (1)	19-22 (1) 19-21 (1)*
Eastern Mediter-ranean & Middle East	08-10 (1)	07-10 (1) 10-12 (2) 12-13 (1) 21-23 (1)	06-08 (1) 18-22 (2)	06-08 (1) 18-21 (1)
Western Africa	08-09 (1) 09-12 (2) 12-13 (1)	10-13 (2) 13-16 (3) 16-17 (2) 17-18 (1)		
Eastern & Central Africa	09-11 (1)	08-10 (1) 13-16 (1) 21-23 (1)	06-08 (1) 18-22 (1)	06-08 (1) 18-21 (1)
Southern Africa	08-10 (1) 10-12 (2) 12-14 (1)	09-13 (1) 13-16 (2) 16-18 (1) 23-01 (1)	18-21 (1)	18-20 (1)
Central & South Asia	17-19 (1)	08-10 (1) 17-18 (1) 18-19 (2) 19-20 (1)	05-08 (1) 17-19 (1)	05-07 (1)
Southeast Asia	14-15 (1) 15-17 (2) 17-18 (1)	08-10 (1) 13-16 (1) 16-18 (2) 18-20 (1)	01-04 (1) 04-07 (2) 07-09 (1)	04-07 (1)
Far East	14-15 (1) 15-17 (2) 17-18 (1)	08-10 (1) 13-14 (1) 14-15 (2) 15-17 (3) 17-18 (2) 18-19 (1)	22-00 (1) 00-02 (2) 02-06 (3) 06-08 (2) 08-10 (1)	23-01 (1) 01-06 (2) 06-08 (1) 01-06 (1)*
South Pacific & New Zealand	14-16 (1)** 11-13 (1) 13-14 (2) 14-16 (3) 16-18 (2) 18-19 (1)	07-08 (1) 08-13 (2) 13-15 (1) 15-16 (2) 16-18 (4) 18-19 (2) 19-21 (1)	20-22 (1) 22-00 (2) 00-07 (3) 07-08 (2) 08-09 (1)	00-03 (1) 03-06 (2) 06-08 (1) 03-06 (1)*
Austral-Asia	14-16 (1)** 12-13 (1) 13-15 (2) 15-17 (3) 17-18 (1)	07-08 (1) 08-11 (2) 11-17 (1) 17-18 (2) 18-19 (3) 19-20 (2) 20-21 (1)	01-03 (1) 03-05 (2) 05-07 (3) 07-08 (2) 08-09 (1)	03-05 (1) 05-06 (2) 06-08 (1) 04-07 (1)*
Caribbean, Central, America & Northern Countries of South America	11-14 (1)** 08-09 (1) 09-10 (2) 10-12 (3) 12-14 (4) 14-15 (3) 15-16 (2) 16-17 (1)	06-07 (1) 07-09 (3) 09-13 (2) 13-15 (3) 15-16 (4) 16-17 (3) 17-18 (2) 18-00 (1) 00-02 (2) 02-03 (1)	18-20 (1) 20-21 (2) 21-23 (3) 23-01 (2) 01-03 (3) 03-04 (2) 04-05 (1)	19-21 (1) 21-03 (2) 03-04 (1) 21-03 (1)*
Peru, Bolivia, Paraguay, Brazil, Chile, Argentina & Uruguay	11-14 (1)** 08-10 (1) 10-12 (2) 12-14 (3) 14-15 (2) 15-16 (1)	06-07 (1) 07-09 (2) 09-13 (1) 13-15 (2) 15-16 (3) 16-17 (4) 17-18 (2) 18-21 (1)	19-21 (1) 21-00 (2) 00-02 (1) 02-04 (2) 04-06 (1)	22-05 (1) 00-04 (1)*
McMurdo Sound, Antarctica	14-16 (1)	07-08 (1) 08-09 (2) 09-11 (1) 15-17 (1) 17-19 (2) 19-21 (1) 21-23 (2) 23-01 (1)	21-00 (1) 00-02 (2) 02-05 (1)	*Nil*

**Indicates best times to listen for 80 meter openings. Openings on 160 meters are also likely to occur during those times when 80 meter openings are shown with a propagation index of (2) or higher.*
***Indicates best time for 10 meter openings.*
For 12 meter openings interpolate between 10 and 15 meter openings. For 17 meter openings interpolate between 15 and 20 meter openings. For 30 meter openings interpolate between 40 and 20 meter openings.

Propagation charts prepared by George Jacobs, W3ASK.

Please come and participate in my online propagation discussion forum at <http://hfradio.org/forums/>. I've also redesigned my Space Weather and Radio Propagation center at <http://prop.hfradio.org>, so take a look. These resources may also be viewed on a cell-phone or other wireless device that has WAP/WML features by browsing to <http://wap.hfradio.org>.

Please drop me an e-mail or send me a letter if you have questions or topics you would like to see me explore in this column. I'd also love to hear any feedback you might have on what I have written. Until next month . . .

73, de Tomas, NW7US/AAAØWA

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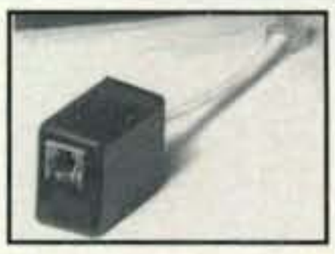
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2004 CQ WW DX 160 Meter Contests *(Continued from page 30)*

Number groups after calls denote score, total QSOs, W/VE multiplier, countries worked. Total multiplier is the addition of the W/VE and countries. Multi-op scores follow single-op listings. An asterisk (*) denotes low power. State, province, and country certificate winners are listed in bold.

2004 CW RESULTS

SINGLE OPERATOR

NORTH AMERICA

UNITED STATES

CONNECTICUT

K1PX*	**189,125**	**849**	**55**	**30**
N4XR	156,692	588	51	35
K1VW	153,510	610	53	33
W1JQ*	**33,715**	**235**	**38**	**17**
K1KI	32,542	165	38	15
W2JU*	18,690	196	41	1
K1BV*	10,880	150	29	3

MASSACHUSETTS

K5ZD	**201,912**	**486**	**51**	**43**
W1FJ	**138,375**	**534**	**53**	**32**
K5MA	117,506	414	47	35
W1KM	74,304	241	34	30
WG1Z*	**19,448**	**193**	**38**	**6**
K1EP*	9,048	141	27	2
W1TW/QRP	**8,676**	**106**	**32**	**4**
N1RL*	7,749	80	35	6
N3KCJ*	5,184	84	35	2
W1TO*	1,548	33	16	2

MAINE

K1JB	**84,594**	**390**	**45**	**24**
K1CP	62,580	246	40	30
AC1O	24,310	176	43	12
N1CGP	18,565	174	44	3
W1CEK/QRP	**7,744**	**106**	**30**	**2**

NEW HAMPSHIRE

KT1V	**377,624**	**919**	**53**	**51**
W1ECT	88,948	409	47	27
WA1Z*	**44,064**	**288**	**38**	**16**
NE1B	32,736	172	49	17
N1IW*	4,728	82	23	1
KM1N*	1,476	35	18	0

RHODE ISLAND

K1DFT	**59,296**	**297**	**43**	**25**
KS1J*	**30,312**	**230**	**39**	**13**
W1YRC	20,496	120	39	22
AJ1M*	1,674	42	17	1

NEW JERSEY

N2NT	**414,960**	**1052**	**55**	**50**
NO2R	**383,968**	**972**	**54**	**50**
N2ED	125,169	521	51	30
WA2VYA	110,058	490	50	28
W2YC	65,065	298	51	26
N2NC*	**39,528**	**232**	**42**	**19**
NO3N	32,190	214	46	12
N2MR	18,819	213	41	0
W1GD*	15,129	134	30	11
W2OO	14,112	137	34	8
K2YLH*	10,980	128	33	3
W2LE	4,292	68	27	2
W2CVW*	2,832	50	24	2
W2JEK/QRP	**2,540**	**56**	**20**	**0**
NJ2OM*	1,569	46	15	0
W5KI*	456	19	12	0
N2GT*	108	9	6	0

NEW YORK

N1EU	**157,590**	**585**	**51**	**39**
K2FU	**127,245**	**584**	**54**	**31**
N2CU*	**97,056**	**566**	**54**	**18**
K2ONP	54,272	314	46	18
WD5T	54,136	259	45	22
NA2M	44,720	226	42	33
K2SX	43,616	271	41	17
W2MU*	41,654	293	46	13
NS2P*	17,204	170	41	3
K2YR*	14,480	149	36	4
WB2ABD*	10,428	99	39	5
N2LL*	7,289	91	36	1
K2TV*	7,223	103	27	4
WB2DVU*	6,150	105	24	1
N2BZP	5,751	90	27	0
W2NRA*	5,478	46	24	9
KD2HE*	2,780	65	20	0
W2CXM*	2,394	51	20	1
N2CK*	2,163	50	21	0

DISTRICT OF COLUMBIA

W3DQ	**37,418**	**314**	**47**	**6**

DELAWARE

AA1K	**622,440**	**1383**	**56**	**58**
N8NA*	**38,688**	**232**	**46**	**16**

MARYLAND

KD4D	**404,328**	**1102**	**55**	**47**
K1HTV*	**180,937**	**756**	**54**	**35**
N3UM	175,063	687	52	37
K3DI	162,536	637	54	34
K2PLF	139,887	523	49	32
K3ZO	80,332	326	45	31
N3AM	75,670	403	50	20
K3TW*	31,111	252	44	9
K2YWE*	22,635	225	40	5
N3FX	22,368	192	41	7
W6NRJ*	14,841	102	39	12
NG3K/QRP	**14,625**	**171**	**38**	**1**
WK3H*	13,320	161	33	4
WA3KYY*	10,990	142	34	1
AK3E*	133	8	6	1

PENNSYLVANIA

W3BGN	**324,462**	**945**	**54**	**48**
WE3C	**289,680**	**973**	**55**	**47**
W3TS	241,605	911	55	36
K3ATO	109,956	558	52	25
K3SV	76,146	330	45	29
W3TDF	73,901	498	47	20
K3SWZ*	**51,870**	**318**	**48**	**17**
N3NR	38,860	254	45	13
W3PT*	21,120	167	35	13
W3RJ	20,475	156	31	14
WW3S*	19,649	169	43	6
K3JGJ	18,544	92	47	14
NA3V*	18,446	175	42	4
K3PH	14,826	140	35	7
W3UHP*	14,274	185	38	1
AD8J*	12,321	145	34	3
W3AG*	9,348	90	34	7
N3KN	8,840	104	28	6
AA3TL	6,206	98	28	1
K3NL*	3,144	54	21	3
KB3CFV*	1,496	44	17	0

ALABAMA

KA1DWX	**62,025**	**311**	**49**	**26**
K4VU*	**54,900**	**400**	**50**	**11**
W4NTI*	29,750	266	44	6
K4WI*	27,390	199	45	10
K4HAL*	25,830	262	42	3
K4IQJ*	21,471	171	37	14

FLORIDA

N4PN	**430,128**	**1193**	**59**	**57**
N4TB	**186,852**	**668**	**52**	**40**
K5KG	149,600	621	52	33
N4WW	136,610	336	52	43
K9OM	83,372	356	47	29
W4SVO*	**72,927**	**370**	**49**	**24**
W4AA*	69,277	312	47	26
AD4Z	64,970	309	48	25
N4BP	50,816	297	48	16
NU4Y	46,060	147	34	36
K4GKD*	39,715	228	45	20
K8XF*	32,724	260	45	9
W4SAA*	28,350	229	42	12
K4JAF*	22,207	131	34	19
W7QF	15,840	142	35	10
N4QV*	14,994	88	34	17
N4EK*	9,361	101	29	8
W4XL*	9,282	93	35	7
KN4Y*	7,490	98	34	1
W5EUQ*	3,584	39	18	10
K1RQ*	2,727	46	25	2
W8IM*	2,472	50	23	1
AC0M	1,978	30	17	6
N4CU*	630	19	13	1

GEORGIA

W8JI	**753,867**	**1495**	**56**	**67**
K4EA	**269,568**	**771**	**55**	**49**
NO4I	222,177	794	54	39
K4BAI	164,027	705	54	35
WA4TT	137,170	447	48	38
N4NX	135,720	532	54	36
KU8E*	**36,192**	**256**	**44**	**14**
W4OWY*	35,112	269	47	9
N4GG	34,736	299	44	8
WF4W	28,832	240	44	9
K4OGG*	27,378	170	37	17
AK4XX	23,595	177	45	10
N4WD*	15,416	136	40	7
K4GA*	13,065	133	36	3
N4XMX	6,422	76	36	2
NJ8J*	6,200	94	30	1
K4PQC/QRP	**3,072**	**60**	**24**	**0**
WB6BWZ/QRP	2,562	58	21	0

KENTUCKY

K4FXN*	**73,856**	**506**	**49**	**15**
KM4FO*	28,428	287	43	3
KM4CH/QRP	**16,598**	**174**	**41**	**2**
K4SAC/QRP	10,320	120	39	1

NORTH CAROLINA

W4ZV	**551,538**	**1237**	**56**	**61**
N4XD	**260,300**	**802**	**54**	**46**
K4SV	137,025	482	51	36
K4DJ*	**61,842**	**378**	**48**	**18**
WA4DOU*	57,070	363	49	16
W4TMR/QRP	**32,454**	**278**	**47**	**7**
NX9T	17,108	156	42	5
N4UH	14,878	146	37	6
W4MY*	13,068	127	41	3
WB4MSG*	12,558	128	36	6
K4GHS*	9,800	123	31	4
W2DZO*	9,472	119	35	2
N4CW	7,050	100	26	4
N4NTO*	3,864	71	20	3
K4QPL*	3,108	50	27	1
AE4EC*	2,205	45	19	2
N4HXI*	1,862	49	19	0

SOUTH CAROLINA

K4CNW*	**148,770**	**650**	**55**	**32**
N2FY	67,470	278	50	28
K4DLJ*	62,169	319	46	23

TENNESSEE

N4IR	**139,590**	**791**	**53**	**23**
K4AMC	84,352	568	49	15
NA4K	84,152	550	52	15
K4RO	75,190	404	52	21
N4TN*	**52,836**	**309**	**48**	**20**
W4DAN*	51,678	431	47	7
W6UB	41,202	235	43	20
W4NZ*	37,464	297	46	10
K1GU	32,720	201	45	15
NY4N*	23,435	252	41	2
K0EJ*	16,875	166	43	2
K4BEV*	16,380	166	41	4
K4BX*	13,065	157	39	0
W4HZD*	12,831	157	38	1
WN4M*	12,519	145	36	3
K4BP*	10,064	135	33	1
KE4OAR*	9,082	110	36	2
WA4GLH*	7,872	87	39	2
W4OGG	7,380	123	35	1
N4JN*	2,175	42	25	0
W4TYU*	741	24	13	0

VIRGINIA

W4MYA	**554,400**	**1314**	**56**	**56**
K4ZW	**405,432**	**1129**	**57**	**51**
K4JA	379,268	991	57	49
			(Op: K4MA)	
WK4Y	162,320	779	51	29
K4OAQ	137,445	708	50	27
W4NF	93,288	407	49	20
N3JB	84,744	476	50	22
WA4PGM/QRP	**68,315**	**446**	**47**	**18**
W3BP*	**66,960**	**487**	**52**	**8**
N4MM	63,072	268	46	27
N4DJ	53,667	309	46	21
WF3J	39,180	242	41	19
W2YE	28,325	203	41	14
K4ORD/QRP	23,625	232	40	5
K7CS*	23,100	235	38	6
KT4U	22,896	139	35	19
W4YE*	15,204	163	37	5
K4GM*	13,613	147	27	4
K4RDU*	10,166	139	32	2
K4EU*	6,292	112	26	0
WB4DNL*	5,174	85	22	4
N4JED*	2,451	60	19	0
KI3O*	1,120	35	16	0

ARKANSAS

K5GO/QRP	**70,211**	**517**	**51**	**10**
			(Op: N5OE)	
W5MK*	**13,366**	**157**	**40**	**1**
W5JAY	11,214	122	39	3
W5RW*	444	17	12	0

LOUISIANA

W5TVW*	**35,412**	**305**	**45**	**8**
K5TC	16,790	158	39	7
W5WMU*	14,079	170	36	3

MISSISSIPPI

N4OGW	**77,035**	**294**	**45**	**26**
NI5F*	**26,082**	**208**	**45**	**9**
W5THT*	832	26	16	0

NEW MEXICO

N5UL	**73,112**	**355**	**51**	**25**
N6ZZ	38,735	267	52	9
K5AM	8,229	87	34	9

OKLAHOMA

N5OT	**199,325**	**984**	**57**	**28**
K2BA*	**152,278**	**955**	**56**	**17**
W5TM*	61,632	336	51	21
N5OHL*	5,425	86	31	0
NE0P*	2,756	53	26	0

TEXAS

K5RX	**355,449**	**1095**	**58**	**51**
N5TW	**168,720**	**749**	**57**	**19**
			(Op: W5TA)	
W0UO*	**159,900**	**878**	**58**	**20**
K5TR	141,225	814	57	19
			(Op: KE5C)	
N5PO	106,080	566	54	24
K5BG	82,636	449	54	19
N5RG	71,213	383	49	22
W5FO	59,112	336	54	18
N5DO*	36,904	290	47	9
AC5HF*	33,060	245	46	12
KB5NJD*	32,285	243	43	12
N5AW*	26,609	170	47	12
K5SF*	22,494	228	42	4
W5CN*	21,266	188	43	6
N5KA	20,257	192	40	7
W5PF	15,824	156	41	5
AF5Z*	13,376	128	37	7
W5ZL*	10,206	100	36	6
W0VX*	8,880	101	37	3
W5XW/QRP	**7,178**	**99**	**30**	**3**
W5GCX*	5,370	38	30	0
NA4M	4,379	49	19	10
KC5OEG*	2,928	54	21	3
W5AC*	1,596	42	10	0
W5GAI*	912	23	15	1
AI5T*	11	104	38	7
N5NJ*	8	4	0	1

CALIFORNIA

N6RO	**181,874**	**798**	**56**	**21**
AC6DD	**154,760**	**718**	**51**	**19**
W0YK	147,735	727	51	12
N6CT	114,594	648	53	18
K6TQ	94,794	696	53	8
			(Op: WN6K)	
KA6W	83,804	406	54	19
K6NR	76,736	470	52	12
W6JTI*	**54,810**	**393**	**48**	**10**
NT6K*	47,530	389	42	7
WT6G	47,011	410	47	6
N6NF	46,816	347	46	10
K6TA	44,517	278	45	12
N6ZFO*	43,513	333	46	7
K6LRN	38,060	293	47	8
W6HG	33,417	314	42	5
K6NY	32,966	278	47	6
NF6S	31,773	231	44	7
KB7V	28,458	220	46	8
K6RB	27,764	287	39	5
K6RIM	27,352	218	43	9
N6HC*	22,140	117	42	3
K6XT	21,666	165	36	10
W7SW	21,240	219	43	2
W6OAT*	19,992	204	34	8
K6YK	17,280	152	42	6
WA5VGI	16,727	138	32	11
W6CWM*	16,226	198	36	2
W6JK*	15,640	176	37	3
W6YX	15,136	151	38	5
W6ISQ	14,040	130	40	5
KI6T	13,201	119	34	0
N6PE	12,384	130	41	2
NN6XX	12,040	162	34	1
KE6QR*	11,256	184	27	1
N6HY	10,146	114	35	3
WA6FGV*	10,070	124	37	1
W6YJ/QRP	**9,333**	**107**	**41**	**2**
W6RKC	8,330	104	31	3
KI6IV*	7,784	136	28	0
AA6EE*	6,758	103	31	0
N6IV*	6,510	82	33	2
W6RTW*	6,328	102	27	1
K6MO	6,204	91	32	1
KX6SUB*	5,525	102	24	1
			(Op: K6III)	
K6DGW*	5,310	131	16	2
WA6BOB*	5,184	78	32	0
N6OU*	4,683	102	20	1
KU6T*	4,564	69	24	4
K6CTA	3,172	50	24	2
KA6UMQ*	2,112	66	16	0
K6CSL*	1,495	52	12	1
K6UFO*	1,008	32	13	1
W6KY*	336	28	6	0
KN6N*	140	14	5	0
W6ZZZ*	116	13	4	0
AD6FR*	90	15	3	0

ARIZONA

W8AEF	**105,768**	**572**	**56**	**12**
K8IA*	**74,685**	**492**	**52**	**13**
W7YS	49,855	377	52	7
KC7V	49,242	280	45	13
AC7A*	34,650	285	49	6
W7ZMD*	22,589	201	43	6
NN7D*	12,129	148	38	1
NN7A*	9,087	105	37	2
NF7E*	6,615	85	33	2

IDAHO

KA7T*	**13,020**	**142**	**39**	**3**

MONTANA

KB7Q*	**39,256**	**321**	**51**	**5**
K7BG*	31,161	269	46	5
KS7T	23,506	232	42	4

NEVADA

N7ON*	**11,729**	**143**	**34**	**3**
W6SA	1,734	44	16	1
NU7T/QRP	**1,358**	**47**	**14**	**0**

OREGON

K0JJ	**19,364**	**171**	**41**	**6**
W3CP*	**16,800**	**173**	**36**	**6**
KI7Y*	1,353	57	11	0
N6PZ*	464	26	8	0

UTAH

NC7X/QRP	**26,592**	**250**	**45**	**3**
W7HS*	**26,500**	**229**	**46**	**7**

WASHINGTON

K7OX	**84,294**	**552**	**53**	**10**
WA7LT	77,958	542	51	10
W7LD*	**24,720**	**178**	**37**	**3**
W7NNN	22,446	230	39	4
N9ADG*	22,403	226	38	5
N6HR	21,935	230	37	4
N7LOX*	21,690	219	41	4
K7UIR	16,800	200	33	3
W7WKR*	13,448	149	37	4
WA7VNI*	8,328	152	22	2
W7DRA/QRP	**5,832**	**107**	**22**	**2**
WA6AWD*	1,918	64	14	0
W7QN*	1,200	54	10	0
N7ZW/QRP	266	16	7	0
K7AWB*	189	12	7	0
W7LKG*	65	5	5	0

WYOMING

KO7X*	**16,856**	**193**	**43**	**0**

MICHIGAN

W8MJ	**138,070**	**809**	**55**	**19**
ND5S	80,829	567	50	13
N8LJ	57,884	437	47	11
K8IR	46,110	348	48	10
K8GT*	**26,520**	**227**	**44**	**7**
K8GVK*	22,150	194	44	6
W8RU	17,748	144	43	8
NG8U*	13,575	200	35	0
K8SIA*	7,360	99	29	3
K8YTO	2,772	45	27	1
NF8M*	602	20	14	0

OHIO

W8CAR	**182,546**	**653**	**55**	**36**
N0FW*	**163,370**	**726**	**55**	**30**
K8MFO/QRP	**110,186**	**638**	**54**	**20**
W8AV	102,975	509	49	26
K8BL*	96,300	521	51	24
K8FH*	84,861	582	50	13
N8BJQ	74,244	435	46	23
K8MR*	49,619	356	48	11
ND8DX	49,197	237	45	24
K8NVR*	46,440	385	46	8
AE8M	38,491	258	46	15
N8XP	37,950	305	48	7
K8AB*	25,599	206	46	7
W8IDM*	21,840	200	42	6
N8IE/QRP	19,223	178	40	7
NC8V*	18,146	185	38	5
W8PN*	15,908	182	39	2
WB8RTJ/QRP	15,795	192	39	0
W8DD*	11,935	154	35	0
NS8O*	11,782	121	37	6
N8XA/QRP	11,718	129	41	1
AD8P/QRP	10,019	102	39	4
N8GU*	6,690	98	30	0
N8VW/QRP	5,460	82	29	1
AF8C*	1,827	39	21	0
W8WTS*	494	16	13	0

WEST VIRGINIA

N8II	**172,375**	**755**	**52**	**33**
K3JT	115,498	350	50	29
K8OQL	107,707	645	53	18
WA8SDA*	**15,498**	**174**	**39**	**2**
K8OWL/QRP	**5,768**	**97**	**28**	**0**
N4ZR*	2,987	44	26	3

ILLINOIS

K2AAW*	**72,735**	**491**	**52**	**13**
K9QVB*	65,160	491	50	10
KX9DX*	60,552	485	52	6
W9SE	51,870	342	51	14
K9MMS*	50,282	348	51	11
AB9H	34,314	261	48	9
WX9U	28,224	209	47	9
K9JE*	16,482	189	40	1
K9WA*	16,008	162	45	1
WA9GQT/QRP	**15,840**	**170**	**42**	**3**
K9IJ*	14,946	136	41	6
N2BJ	12,480	150	39	1
KG9N	11,954	104	34	9
AI9L	11,352	101	37	7
W9PNE/QRP	7,752	84	37	1
WB9AYW*	2,400	42	24	1

INDIANA

KD9SV	**151,392**	**697**	**55**	**28**
KE9I	**121,107**	**631**	**53**	**26**
KJ9C*	**102,060**	**629**	**52**	**18**
K9WWT	87,714	381	53	13
K9NW	86,760	508	52	20
K9WJU*	70,246	492	48	14
			(Op: W9CG)	
W9RE	50,853	300	50	17
K9SG	34,020	235	47	13
WT9U*	25,155	242	42	3
K9WX*	18,964	199	41	3
KA9F*	15,918	165	39	3
AD9T/QRP	**8,510**	**103**	**36**	**1**
K9MI*	6,692	112	28	0

WISCONSIN

K9AY	**163,593**	**822**	**57**	**26**
WA9IRV	**114,456**	**632**	**55**	**21**
K9OT*	**56,876**	**426**	**51**	**8**
WI9WI	55,460	422	51	8
WA1UJU*	25,991	254	44	3
K0PJ*	15,400	124	41	9
WA9TZE	12,628	133	42	2
K9DA*	10,320	119	39	1
NI9C*	7,630	100	34	1
K9TY	5,082	74	32	1
W9HR*	2,697	42	29	0

COLORADO

K8FC	**111,785**	**571**	**56**	**23**
N9CO*	**71,808**	**516**	**54**	**10**
K0RI/QRP	**25,493**	**211**	**46**	**7**
NO2D*	20,640	198	44	4
WU0L/QRP	19,440	207	44	1
K0UE*	14,916	161	42	2
N0HF*	6,720	90	34	1
KC7QY*	5,100	72	34	0
KV0K*	2,889	49	26	1

IOWA

N0AC	**108,004**	**720**	**56**	**11**
N0NI	99,705	628	57	12
			(Op: N0AC)	
K0IO	43,859	315	50	11
N0YY	40,360	262	51	13
W0NFL*	**23,856**	**199**	**50**	**6**
KE0FT*	8,029	104	37	0
WY0V*	2,916	54	27	0

KANSAS

W0UY	**35,695**	**300**	**48**	**7**
K0BJ*	**35,197**	**245**	**48**	**13**
KG0UA	33,642	284	47	7
K0XM*	20,350	151	44	11
N0UU*	1,400	31	19	1

MINNESOTA

W0HW	**69,168**	**480**	**56**	**10**
KS0T*	**37,259**	**312**	**44**	**9**
W0SEI/QRP	**24,128**	**211**	**48**	**4**
AC0W*	19,159	171	44	5
WA2MNO*	18,495	192	44	1
K4IU	15,312	156	42	2
K0CAT	11,235	150	35	0
			(Op: K9WIE)	
W0RK*	8,151	97	37	2
N0AT*	7,844	100	37	0

MISSOURI

KU1CW	**295,494**	**1046**	**57**	**45**
AE9B	**242,970**	**1083**	**57**	**34**
N0TT*	**149,840**	**773**	**56**	**24**
K0DEQ	75,042	504	52	14
K0JPL*	69,489	498	51	12
W0TT	55,571	407	50	11
W0VD*	33,488	300	50	2
KC0M*	26,724	244	48	3
W0TY	19,182	188	41	5
K0OU*	13,120	146	38	3
N0OCT/QRP	**6,685**	**94**	**35**	**0**

NORTH DAKOTA

K0VX*	**3,225**	**63**	**25**	**0**

NEBRASKA

WN0L*	**13,018**	**123**	**42**	**4**

SOUTH DAKOTA

K7RE*	**98,800**	**688**	**53**	**12**
KC0CGR*	27,936	273	48	0

CANADA

NEWFOUNDLAND

VO1TA	**96,760**	**225**	**27**	**32**
VO1AU	33,744	103	26	22
VO1HP	27,368	83	19	25

QUEBEC

VE2RA	**89,097**	**364**	**45**	**6**
VE2AWR*	**33,150**	**174**	**35**	**4**
VE2XAA*	18,144	135	27	1
VE2OWL*	5,434	53	21	1

ONTARIO

VE3EJ	**525,868**	**1022**	**56**	**42**
VE3AT	**404,432**	**859**	**56**	**36**
VE3DZ	402,876	857	57	36
VE3QAA	253,125	622	50	31
VE3PN	212,949	511	51	30
VE3OSZ*	**133,254**	**411**	**49**	**17**
VE3KP*	124,830	449	48	9
VE3MGY/QRP	**73,083**	**297**	**47**	**4**
VE3RCN*	39,663	213	38	1
VE3CR*	39,522	195	38	4
VE3AGC*	37,625	181	41	2
VE3RER*	30,360	179	40	4
VA3IX*	28,490	170	34	1
VA3NR*	26,130	140	37	2
VE3GLO*	21,216	140	31	1
VE3XAT*	17,880	124	28	2
VE3BNO*	12,546	78	31	3
VE3WZ/QRP	10,800	90	25	0
VE3SS*	2,538	30	18	0

SASKATCHEWAN

VE5UF*	**11,780**	**79**	**31**	**0**

ALBERTA

VE6EX*	**21,152**	**140**	**32**	**0**
VE6SF	8,418	75	20	3

BRITISH COLUMBIA

VE7UF	**66,003**	**275**	**43**	**6**
VE7SL*	**51,510**	**205**	**45**	**6**
VE7ALN*	10,752	95	24	0
VE7WU*	10,611	81	26	1
VA7MM*	2,340	42	12	0

VE7FO*	1,510	32	10	0
VE7JKZ	270	126	14	1
VA7CAB*	87	7	3	0
BAHAMAS				
C6AYB*	**415,800**	**885**	**53**	**35**
			Op: K3BU)	
BARBADOS				
8P6EX*	**6,665**	**37**	**17**	**14**
BELIZE				
V31YN	**153,180**	**363**	**48**	**26**
CUBA				
CO2JD/QRP	**90,573**	**317**	**47**	**10**
CO8ZZ*	**66,468**	**220**	**40**	**8**
CO8LY*	57,524	262	43	8
CO2CI*	28,767	134	40	3
DOMINICAN REPUBLIC				
G4RCG/HI9*	**452,720**	**583**	**51**	**29**
JA6WFM/HI8	34,320	140	31	13
MARTINQUE				
FM5GU	**367,540**	**723**	**54**	**40**
MEXICO				
XE1V	**65,137**	**245**	**46**	**7**
XE2AC*	**20,330**	**106**	**35**	**3**
XE1MM	7,668	57	22	5
XE2MX*	2,775	37	15	0
US VIRGIN ISLANDS				
KV4FZ	**532,860**	**807**	**54**	**53**

AFRICA

CANARY ISLANDS				
EA8BH	**1,936,746**	**1540**	**51**	**75**
			(Op: OH2PM)	
EA8JF*	**33,880**	**86**	**6**	**34**
CAPE VERDE ISLANDS				
D4B*	**1,293,732**	**1073**	**51**	**70**
			(Op: 4L5A)	

ASIA

AFGANISTAN				
YA8G	**62,604**	**201**	**0**	**27**
ASIATIC RUSSIA				
UA9CLB	**472,890**	**771**	**1**	**65**
UA9FAR*	**229,320**	**441**	**0**	**56**
RG9A	209,002	657	0	62
			(Op: UA9AM)	
RL9F	200,372	392	0	56
UAØANW	130,101	302	0	51
UA9CBM*	70,766	210	0	41
RW9QA*	69,948	222	0	36
UA9SP*	59,436	188	0	36
UAØACG	53,108	177	0	34
RX9TX	42,439	131	0	37
RK9CR*	38,304	154	0	28
UA9MQR*	25,470	85	0	33
RV9WZ*	20,112	89	0	24
UA9AX*	12,038	52	0	26
UAØSC	4,550	59	0	13
RX9WN*	3,367	28	0	13
RAØFF*	2,280	44	1	9
RUØAT*	2,160	40	0	10
RWØLKA*	1,164	60	0	4
RAØBA	10	1	0	1
AZERBAIJAN				
4K9W*	**13,750**	**68**	**0**	**22**
HONG KONG				
VR2EH*	**3,120**	**46**	**0**	**12**
ISRAEL				
4Z5MU*	**55,608**	**138**	**2**	**40**
JAPAN				
JH4UYB	**113,208**	**295**	**16**	**37**
JA5DQH	95,506	249	17	36
JH3AIU	30,564	132	10	26
JEØVJV	16,709	73	9	22
JA5IP	2,639	38	5	8
JE1SPY*	**1,728**	**55**	**0**	**9**
JE1TSD*	1,551	33	2	9
JH7IMX*	1,450	35	4	6
JR3NZC*	1,170	15	5	4
JP1SRG*	576	18	1	7
JK1AJX/7*	414	19	1	5
JK2VOC*	376	26	0	4
JA1IZZ*	245	12	2	3
JE3UHV*	207	23	1	2
JK7CJM	72	7	0	3
JA1XPU*	20	10	0	1
JA1VVH*	14	7	0	1
JA1GTF/QRP	10	5	0	1
KAZAKHSTAN				
UN7JX*	**2,660**	**19**	**0**	**14**
UN4PD/QRP	735	14	0	7
OMAN				
A45XR	**385**	**612**	**4**	**66**
SOUTH KOREA				
DS5DNO*	**1,285**	**54**	**0**	**5**
HL5UOG	376	40	0	2
SINGAPORE				
9V1GO	**17,970**	**73**	**0**	**30**
TAJIKISTAN				
EY8MM	**418,554**	**700**	**3**	**64**
UNITED ARAB EMIRATES				
A61AJ	**978,439**	**1090**	**31**	**66**
			(Op: S53R)	
UZEBEKISTAN				
UK9AA	**51,480**	**148**	**0**	**40**

EUROPE

ALAND ISLANDS				
OHØNL	**311,933**	**1015**	**2**	**57**
AUSTRIA				
OE3I	**428,925**	**1078**	**16**	**59**
			(Op: OE1JNB)	
OE1TKW	20,010	137	0	29
BELARUS				
EU6EU	**310,104**	**793**	**10**	**62**
EU1AZ	277,062	864	5	56
EW3LN	106,624	414	1	48
EV6M*	**76,320**	**356**	**0**	**40**
EW6MM*	10,638	80	0	27
BELGIUM				
ON4AEK	**470,844**	**967**	**26**	**61**
ON4WW	432,408	928	22	64
ON6AA	383,332	682	33	51
ON4ATW	319,650	779	16	59
BOSNIA				
T94LW*	**70,884**	**390**	**0**	**36**
BULGARIA				
LZ2DF*	**194,712**	**661**	**3**	**54**
LZ2UZ*	**100,935**	**430**	**0**	**45**
LZ1DQ*	98,340	442	0	44
LZ1AG*	45,090	189	0	45
LZ9R*	24,614	156	0	31
			(Op: LZ3YY)	
LZ2BE	4,978	50	0	19
LZ1MC/QRP	**2,448**	**30**	**0**	**17**
LZ1AQ*	2,352	30	0	16
CORSICA				
TK5MH	**79,195**	**322**	**0**	**47**
CROATIA				
9A2NO*	**102,388**	**376**	**0**	**52**
9A3RE*	99,572	456	0	44
9A2VQ/QRP	**46,968**	**254**	**0**	**38**
9A5MT*	38,681	158	0	47
9A4BT/QRP	15,376	100	0	31
9A7ZZ*	10,649	95	0	23
CZECH REPUBLIC				
OK1RF	**779,520**	**1229**	**34**	**78**
OK1DX	**545,625**	**1056**	**25**	**72**
OK1FDY	346,442	824	18	65
OK1DSZ	309,168	839	16	56
OL8R	295,302	727	23	56
			(Op: OK1FCJ)	
OK1CF*	**266,070**	**782**	**13**	**57**
OK1AVY	257,832	725	16	56
OK1TP	240,316	685	10	63
OK1DXR	239,554	693	19	52
OK1IW	209,473	715	9	52
OK1WF	207,204	691	9	53
OK1EP	205,260	602	19	47
OK1IF*	192,966	698	9	49
OK2AB*	157,100	665	0	50
OK1MQ	153,192	612	8	44
OK1MNW*	148,998	544	6	51
OK1AY*	141,075	548	4	51
OK2BYW*	138,945	491	6	53
OK1AYY	131,382	516	7	47
OK1JOC*	126,540	454	9	48
OL6T*	119,034	499	3	39
			(Op: OK1DCF)	
OK2PBM*	104,569	412	6	47
OK1FC*	101,136	449	4	48
OLØA*	96,350	405	1	49
			(Op: OK1CZ)	
OK1FKD/QRP	**95,150**	**418**	**3**	**47**
OK1AOV	94,428	310	5	56
OK1DXD*	93,170	346	8	47
OK1DOY*	85,140	397	3	42
OK1DSX*	79,140	383	0	45
OK1XJ	75,024	334	4	44
OK1AUP*	67,218	276	3	48
OK2PVF	59,972	298	0	44
OK2PMS	58,275	270	1	44
OK1AXB	57,876	225	3	50
OK1MMN*	55,356	285	1	41
OK1ES/QRP	54,202	297	0	41
OK1WMV*	53,856	335	0	36
OK1GS*	53,314	314	0	38
OK1ZCW*	52,808	287	0	41
OK2DU*	52,730	305	2	43
OK1XR/QRP	52,546	283	0	41
OK1MZO*	50,061	269	0	41
OK1KZ*	42,822	239	1	38
OK2BQL*	40,194	200	0	42
OK2PHC*	38,418	224	0	38
OK1VBA/QRP	35,574	248	0	33
OK2BPL*	35,568	206	0	38
OK1ARN*	32,410	210	0	55
OK1FOG*	31,083	166	0	39
OK1JN*	29,343	259	0	27
OK2BMU*	27,429	135	0	41
OK2PDT*	27,280	191	0	31
OK1DOF*	23,170	148	0	35
OK1IBP*	22,209	149	0	33
OK2TRN*	22,011	180	0	29
OK2PBG*	20,448	114	0	36
OK1ARO*	18,850	133	0	29
OK2BZM*	16,800	125	0	30
OK1FHI*	16,532	117	0	31
OK1XC*	7,546	77	0	22
OK1DWJ	6,675	31	12	13
OK1HCG/QRP	6,162	49	0	26
OK1VWK*	3,825	48	0	17
DENMARK				
OZ7YY	**659,424**	**1249**	**24**	**72**
OZ5UR*	**17,344**	**109**	**0**	**32**
OZ5WQ*	8,910	59	0	30
OZ4O	7,196	49	0	28
ENGLAND				
MØC	**655,032**	**1194**	**32**	**66**
			(Op: G4TSH)	
M2D	**502,251**	**1061**	**25**	**62**
			(Op: G4BYG)	
G3XTT	325,786	693	24	58
G3XGC	160,034	410	20	51
GØIVZ	140,992	372	24	40
G3PJT	117,130	428	9	44
G3GLL	86,580	317	2	50
M3C	80,195	379	3	40
			(GØVQR)	
GØMTN	39,560	198	2	38
GØDCK/QRP	**34,596**	**195**	**0**	**36**
G3SVL*	**26,320**	**123**	**5**	**35**
G3YMC/QRP	19,620	138	0	30
G3JJZ*	18,907	98	2	35
G4IIY	18,144	103	0	36
G3SJJ	17,464	98	0	37
G4DRS	14,391	71	0	39
GØVDZ*	14,310	108	0	27
G3GMS*	9,145	61	0	31
GØHDB*	7,950	55	0	30
ESTONIA				
ES2DJ	**183,205**	**637**	**3**	**52**
ES6KW*	**12,258**	**91**	**0**	**27**
FINLAND				
OH5NE	**128,565**	**558**	**0**	**45**
OH2RA	99,593	405	0	47
OH2BO	60,352	251	1	45
OH5PT	49,248	193	0	48
OH5TS*	**30,040**	**141**	**0**	**40**
OH3WD	29,064	130	0	42
OH6NIO*	23,380	132	0	35
OH3UU	22,962	101	0	43
OH2OM*	175	7	0	5
FRANCE				
F5RZJ	**312,732**	**667**	**28**	**56**
F5VHY	**221,437**	**435**	**31**	**48**
F6GOX	125,457	424	10	47
F8BPN*	**98,406**	**288**	**18**	**45**
F5BBD*	76,979	297	10	39
F5NQL*	65,925	292	5	40
F6HWU	25,116	109	8	31
F8GC	18,680	82	6	34
F6HHR*	16,590	113	0	30
F5RAB	12,660	76	6	24
F5JDG*	8,188	73	0	23
F6FTB*	3,087	30	0	21
GERMANY				
DL1AUZ	**643,754**	**1105**	**31**	**78**
DJØMDR	418,860	929	27	63
DL1YD*	**244,013**	**641**	**20**	**57**
DF9ZP	239,878	684	15	58
DL9EE	231,192	656	14	58
DJ6BQ	190,344	596	16	50
DL7UCX	178,158	519	15	54
DL5YM*	147,070	560	7	48
DL4CF	130,418	681	7	54
DF8AA*	129,210	453	8	51
DL8VL*	129,006	507	6	48
DH8VV	117,975	453	8	47
DL5SE	117,594	550	1	46
DL6QW*	100,204	407	5	47
DF3KV/QRP	**94,335**	**344**	**9**	**48**
DJ5MW	93,389	436	0	47
DL1NEO	92,000	402	2	48
DL5KUT*	91,652	474	3	41
DL1VDL	91,465	340	6	49
DK3RA*	87,073	383	0	49
DL5JS*	76,986	401	2	40
DL4JYT*	72,540	355	0	45
DJ3RA*	65,753	299	4	43
DJ9MH*	65,065	255	6	49
DL5LYM	61,152	258	2	46
DJ9NMH*	60,417	270	3	46
DL2BWM*	59,240	327	0	40
DKØNS*	58,032	235	7	45
DL2MY*	56,850	247	5	45
DJØIF	55,104	281	0	41
DL5NDX*	52,560	331	0	36
DJ8UV*	52,503	264	3	40
DL4NAC	51,954	225	2	40
DL8DWW*	51,920	288	0	40
DL3ZAI*	51,680	305	0	38
DK3GI*	51,600	157	0	43
DL2RUG*	48,243	261	2	37
DL6NCY*	43,870	228	0	41
DK5WL	43,728	179	3	45
DLØVLA*	43,374	234	0	42
			(Op: DL1JFM)	
DL9SXX/QRP	42,432	248	0	39
DK3YD	42,032	253	0	37
DL1SAN	41,680	227	3	37
DJØIP*	41,116	240	0	38
DK7VW*	40,880	224	0	40
DJ2YE*	37,962	217	0	38
DH8AF*	37,843	200	1	40
DL3DRN*	35,920	193	0	40
DL3TD*	35,088	242	0	34
DJ3LE*	34,010	193	0	38
DKØFY	33,858	186	1	37
			(Op: DF9ZP)	
DLØDX*	33,781	197	2	35
DL3ARM*	32,544	198	0	36
DKØMD*	31,430	196	0	35
			(Op: DL5JS)	
DL2NBU	31,144	214	0	34
DK6CQ*	30,168	182	0	36
DL4KUG*	29,489	159	0	37
DL4WG	28,854	135	2	40
DHØGHU*	28,314	160	0	39
DLØXYL	26,598	179	0	33
			(Op: DF4IJ)	
DF2IAX*	26,381	196	0	31
DL2RMC*	24,465	149	0	35
DK2GZ*	24,272	139	0	37
DK8JH*	23,715	174	0	31
DK7FP*	23,170	144	1	34
DL6UKL*	23,072	159	0	32
DJ9RR*	22,620	173	0	30
DL3FF	22,386	121	0	39
DL8NBJ*	22,338	145	0	34
DL9NDS*	21,514	157	0	31
DL6KVA*	20,672	130	0	34
DK9HE*	20,128	126	0	34
DL3NM*	19,180	135	0	35
DF6WE*	17,429	134	0	29
DL6UAA*	16,401	109	0	33
DJ5IR*	14,935	113	0	29
DL1LAW/QRP	14,526	125	0	27
DJ9AO*	14,391	118	0	27
DJ8QP*	13,978	108	0	29
DL6RO*	13,728	78	0	33
DL2QT*	11,856	115	0	24
DK3UA*	9,599	67	0	29
DJ3GE/QRP	9,429	106	0	21
DL4LQM	9,128	71	1	27
DKØES*	8,602	89	0	22
		(Op: DH4SBO)		
DJ2IE*	8,424	81	0	24
DLØSHZ*	8,376	80	0	24
		(Op: DL1ASR)		
DH4SBO*	8,316	91	0	21
DM5TI*	7,008	48	0	32
DL6RAW/P	5,020	52	0	20
DL9OT*	5,019	52	0	21
DJ7MGQ	2,565	39	0	15
DJ9UW*	2,704	44	0	13
DL3MBG*	2,289	23	0	21
DK2ZO*	174	7	0	6
DL2LAR	14	2	0	2
DL4GBA*	10	5	0	1
GREECE				
SV1RP	**295,490**	**864**	**11**	**54**
SX8X/QRP	**62,624**	**325**	**0**	**38**
SV8CS	35,376	135	1	47
SV1DPI*	**8,424**	**61**	**1**	**26**
HUNGARY				
HA8DU	**754,844**	**1183**	**30**	**77**
HA8BE	**489,716**	**974**	**24**	**68**
HA1CW*	**204,840**	**675**	**11**	**49**
HA3NU	145,591	408	14	53
HA7TM*	135,216	497	2	52
HA3OU*	12,582	98	0	27
HAØGK/QRP	**5,058**	**58**	**0**	**18**
HA1WD/QRP	3,344	43	0	16
IRELAND				
EI/OK1TN	**620,620**	**1237**	**24**	**67**
EI6IZ	205,692	623	21	40
ITALY				
IK2PFL	**152,950**	**399**	**16**	**54**
IK2HKT	**139,442**	**520**	**0**	**53**
I7/9A3A	132,216	413	11	50
I2SVA	79,662	301	8	43
I2AZ*	**70,470**	**318**	**0**	**45**
IK2ANI	55,641	207	7	44
IK2SND*	54,225	237	3	42
IK3ORD*	12,393	96	0	27
LATVIA				
YL5W	**375,675**	**966**	**11**	**64**
YL2PQ	284,345	984	10	63
YL3DX/QRP	**59,459**	**319**	**0**	**37**
LITHUANIA				
LY2IJ	**544,712**	**1062**	**22**	**72**
LY3UM	**530,016**	**1001**	**10**	**76**
LY2BW	335,711	936	9	70
LY2HN*	**183,711**	**621**	**6**	**51**
LY3BW*	152,620	565	4	48
LY2OU	132,924	449	4	53
LY2UF*	114,915	484	0	47
LY3BA*	83,202	388	0	42
LY2BBF*	56,430	298	0	38
LY2LE*	46,269	161	2	51
LY2MM*	39,479	216	0	37
LY2GW*	27,296	211	0	36
LY2OO*	27,126	170	0	33
LY2OM*	18,048	114	0	32
LY2IC*	7,296	68	0	24
LY3BY/QRP	384	17	0	6
LUXEMBOURG				
LX1NO*	**41,560**	**207**	**0**	**40**
MACEDONIA				
Z36W*	120	6	0	4
MALTA				
9H1XT	**138,054**	**460**	**4**	**53**
MOLDOVA				
ER2G	**33,600**	**149**	**1**	**41**
NETHERLANDS				
PAØLOU	**191,202**	**556**	**8**	**58**
PA5A	**190,334**	**643**	**10**	**49**
PA3GVI*	**120,834**	**491**	**4**	**45**
PAØINA*	90,864	384	0	48
PA3AAV*	76,572	260	10	44
PAØBWL*	64,880	326	1	39
PA5TT	58,632	275	0	42
PAØJNH	58,590	279	2	40
PA5WT*	56,070	272	0	42
PG3N*	52,644	254	1	40
PA3AFF*	50,400	236	5	37
PA5O*	25,216	162	0	32
PA2N*	23,125	127	0	37
PG7V*	20,057	133	0	31
PAØLSK*	16,559	116	0	29
PA3BNT*	14,012	91	0	31
PAØWRS*	13,533	62	2	37
PAØFAW/QRP	**4,746**	**47**	**0**	**21**
PA1W/QRP	2,520	36	0	14
PAØB*	1,508	25	0	13
NORWAY				
LA9VDA	**162,078**	**625**	**4**	**47**
LA7AK	132,692	530	2	47
LA8WG*	**18,942**	**113**	**0**	**33**
LA6PB*	17,893	124	0	29
LA9DK*	9,686	67	0	29
LA1YE*	2,924	35	0	17
POLAND				
SN7Q	**852,452**	**1406**	**30**	**76**
SO2R	**811,832**	**1324**	**27**	**82**
SP4R	348,733	854	11	66
SP6A*	**185,684**	**589**	**5**	**56**
SP4JWD	155,556	515	5	53
SP5DIR*	103,632	420	0	48
SP9FZC*	96,705	435	1	44
SP4GFG/QRP	**85,822**	**368**	**0**	**47**
SQ9FMU*	78,188	359	0	44
SO6A*	75,240	337	1	44
SQ9IDE*	74,680	385	0	40
SP2DNI*	54,464	301	0	37
SN5J*	53,390	291	0	38
			(Op: SP5JXK)	
SP3PL*	45,708	160	5	47
SP9NH*	38,360	217	0	35
SP6BEN*	29,792	160	0	38
SP6AEG	28,800	119	0	45
SP5BYC*	27,602	149	0	37
SP4TBM/QRP	20,889	128	0	33
SO1VAF*	17,777	127	0	29
SP3OL*	15,957	123	0	27
SP5GH	14,664	52	2	45
SP8QED/QRP	7,568	72	0	22
SP7AWG*	2,940	27	0	20
SP2EXN*	1,980	27	0	15
SP1DTG*	1,848	26	0	14
SP4Z*	144	6	0	4
PORTUGAL				
CT1FJK	**487,931**	**696**	**40**	**61**
CT1ILT	478,926	818	36	62
ROMANIA				
YO5BRZ*	**197,334**	**676**	**9**	**48**
YO5PBF	**183,954**	**793**	**0**	**46**
YO2IS*	181,608	629	2	54
YO6BHN*	174,363	473	10	59
YO2RR	78,750	346	4	41
YO3ND*	61,815	304	0	39
YO3APJ*	38,850	179	6	36
YO9HP*	34,020	157	0	42
YO7BGA	18,060	132	0	28
YO3BWK*	17,888	109	0	32
YO3III*	17,267	108	0	31
YO4ATW/QRP	**15,090**	**104**	**0**	**30**
YO2GL*	8,704	55	0	32
YO6ADW*	7,960	84	0	20
RUSSIA				
UA6LV	**428,452**	**818**	**15**	**79**
RZ3QU	**302,247**	**829**	**6**	**65**
RD3A	203,314	685	4	55
			(Op: RD3AF)	
UA4PT*	**161,652**	**541**	**0**	**57**
RA6LBS	159,264	575	4	52
RX4HZ	150,426	480	0	61
RV1CC	141,018	502	2	55
RA3XA*	126,672	465	5	51
UA4FER	121,420	463	1	51
RZ3DX	121,300	492	0	50
UA4RC	103,578	333	2	59
RU6FA*	86,788	333	0	52
RK4HD*	79,200	358	0	45
RU3GN*	78,720	327	0	48
RU1AO	78,676	300	0	52
RV6ASU*	76,650	303	2	48
RN4WA*	70,923	296	0	47
UA1QV/P*	70,686	356	0	42
UA4LY	57,500	221	2	48
RZ3VA*	56,901	300	0	39
RV3ID	53,840	278	0	40
RK3DH*	53,268	231	0	46
RV4LC*	46,930	256	0	38
RW3AI/QRP	**43,680**	**227**	**0**	**40**
RK6ATQ*	42,159	175	0	47
RA3CQ*	40,807	190	0	43
UA3AGW	37,625	174	0	43
RX3OM*	35,460	202	0	36
RA6CT*	35,150	196	0	37
RU3DM*	34,188	171	0	37
RU6LG	31,745	188	0	35
RA6MS*	23,219	156	0	31
RA3NZ*	17,577	121	0	31
RK6BZ*	13,972	104	0	28
RV3TC*	13,896	125	0	24
RU3VD*	12,250	107	0	25
UA1AKE	10,944	52	0	36
UA3TCJ*	9,744	69	3	28
RN1AO*	8,289	61	0	27
RA1ACY*	7,280	80	0	20
UA6CT	6,216	34	1	27
RU3RQ*	3,196	33	0	17
RW4PY*	2,086	30	0	14
SARDINIA				
ISØ/YO3RA	**47,840**	**196**	**3**	**43**
ISØOMH*	**8,970**	**69**	**0**	**26**
SCOTLAND				
GM2Z	**345,499**	**834**	**20**	**57**
			(Op: MMØDFV)	
MMØCCC*	**17,112**	**110**	**0**	**31**
SERBIA AND MONTENEGRO (YUGOSLAVIA)				
YU1EXY	**777,920**	**1231**	**36**	**74**
YT6A	606,572	1103	27	71
YU7AV	596,695	1118	27	68
YU1ZZ	493,272	937	27	66
YU1RA/QRP	**130,845**	**414**	**5**	**56**
YT7LY/QRP	82,300	321	1	49
4N1A*	**14,058**	**74**	**6**	**27**
			(Op: YU1UA)	
SICILY				
IT9ZGY	**229,854**	**441**	**26**	**61**
IT9ORA*	4,400	43	0	20
SLOVAKIA				
OMØM	**669,936**	**1155**	**29**	**73**
			(Op: OMØWR)	
OM3OM*	**227,164**	**720**	**7**	**54**
OM7RU*	211,236	712	9	49
OM6TY*	171,215	621	6	49
OM7DX/QRP	**164,136**	**600**	**3**	**53**
OMØTT*	134,502	464	7	51
OM4DN*	117,180	525	0	45
OM5JA*	107,436	520	0	42
OM7AG*	38,961	200	0	39
OM7PY*	36,960	218	0	35
OM6ALP*	23,664	170	0	29
OM4APD/QRP	14,880	129	0	24
OM4AMA*	12,300	99	0	25
SLOVENIA				
S5ØA	**708,864**	**1189**	**34**	**70**
S57M	**623,150**	**1015**	**35**	**68**
S57DX	487,160	936	28	67
S53O	463,605	909	24	69
S57UN	401,305	692	15	68
S5ØR	289,226	730	22	51
S57Q	286,200	743	14	58
S58Q	237,020	639	24	56
S59AA	200,395	589	13	52
S51NZ*	**121,100**	**490**	**5**	**45**
S51DX*	322	10	0	7

SPAIN				
EA1DAV	**360,226**	**732**	**31**	**51**
EA5FID	**301,760**	**629**	**19**	**54**
EA4BQ	209,742	433	32	46
		(Op: OHØXX)		
EA7RM*	**131,577**	**383**	**17**	**44**
EA2LU/P	105,964	318	23	36
EA7NW*	56,160	210	1	51
EA4NP*	42,862	241	22	44
EA2CMY*	42,274	181	6	40
EA4DRV*	35,235	148	9	36
EA4KA*	10,472	74	3	25
EA2BNU*	5,400	57	0	20
EA1DDU*	3,654	33	0	21
EA5DCL*	1,956	25	0	16
EA4UT*	1,170	20	0	13
EA5AAJ*	350	10	0	7
SWEDEN				
SM6CNN	**233,926**	**724**	**5**	**57**
7S7V*	**226,142**	**756**	**7**	**51**
SM7GIB	167,712	686	0	48
SM6BGA	50,061	240	3	38
SM5CCE	45,305	217	0	41
SM6WQB	44,280	247	0	36
SM7BJW*	26,697	162	0	33
SM6IQD*	15,109	106	0	29
SM5BUV*	11,281	78	0	29
SM1TDE	11,144	81	0	28
SWITZERLAND				
HB9ARF*	**171,100**	**563**	**8**	**51**
HB9CIP	60,624	117	21	51
HB9HQX/QRP	**4,998**	**60**	**0**	**17**
UKRAINE				
UY5ZZ	**217,164**	**591**	**5**	**64**
UX5NQ*	**209,850**	**835**	**2**	**48**
UT5DL*	205,372	621	7	57
UXØIB	157,685	555	1	54
UR5MID	124,379	375	8	53
UT2UB	124,124	473	2	50
UYØIX*	114,600	450	0	50
UR6IJ*	113,456	388	4	52
UT1FA*	113,152	426	4	48
UYØZG	107,305	385	3	52
US2WU*	106,344	364	2	54
USØZZ	96,465	310	8	51
UX8IX/QRP	**77,486**	**355**	**1**	**42**
EN1U	74,307	309	0	47
		(Op: UX1UA)		
UR8RF*	71,197	279	4	45
UT8IM*	65,688	278	3	43
UT4NW*	58,170	278	0	42
UUØJL	55,637	280	0	41
USØKW/QRP	51,127	231	0	43
UY5TE*	47,766	253	0	38
UU2JA*	37,600	149	0	47
US4EX/QRP	30,822	182	0	33
UT4ZG*	29,751	112	0	47
UT2UZ*	29,155	175	0	35
US7IB*	28,480	180	0	32
UW5U/QRP	27,819	169	0	33
US6IMA*	26,899	145	1	36
UX2IQ*	26,258	138	0	38
US7IA*	26,158	176	0	29
UT5UML*	15,988	115	0	28
UT7GX*	9,640	98	0	20
US9QA*	7,566	58	0	26
UT3IW*	1,020	13	1	11

OCEANIA

MARIANA IS				
KHØA*	**16,351**	**187**	**0**	**9**
		(Op: JF1MIA)		
HAWAII				
KH7X	**318,385**	**493**	**50**	**15**
N6KB/KH6	32,674	107	28	3
INDONESIA				
YEØX	**25,402**	**100**	**0**	**26**

SOUTH AMERICA

BRAZIL				
PY2OW	**15,840**	**54**	**17**	**16**
PY2DO	4,935	25	9	12
PY1KX*	252	6	1	5
CURACAO				
PJ2S	**1,099,122**	**1000**	**51**	**60**
		(Op: GØCKP)		
FERNANDO DE NORONHA				
PRØF	**438,925**	**458**	**47**	**50**
		(Op: W5SJ)		
VENEZUELA				
YV1DIG	**89,090**	**151**	**31**	**28**
YV7QP*	**18,125**	**64**	**20**	**9**

CW MULTI-OPERATOR

NORTH AMERICA

UNITED STATES

CONNECTICUT				
NZ1U	**112,575**	**390**	**44**	**35**
MASSACHUSETTS				
K1TTT	**313,300**	**910**	**54**	**46**
NEW HAMPSHIRE				
KC1XX	**493,062**	**1106**	**55**	**56**
KØTV	205,478	706	53	38
RHODE ISLAND				
W1QP	**60,450**	**269**	**38**	**37**
NEW JERSEY				
W2GD	**532,180**	**1224**	**56**	**62**
W2MF	163,116	566	56	36
K2QWE	24,978	231	39	7
K2GN	24,200	189	37	13
N2VW	10,542	87	31	11
K2SB	10,209	99	34	7
NA2U	3,740	79	21	1
NEW YORK				
W2XL	**156,948**	**633**	**54**	**33**
NØN2W	111,750	561	49	26
NJ1F	7,922	99	31	3
DISTRICT OF COLUMBIA				
4U1WB	468	26	9	0
MARYLAND				
W3EKT	**50,468**	**220**	**45**	**29**
W3UL	40,658	296	44	14
PENNSYLVANIA				
W3GH	**270,712**	**794**	**55**	**49**
K3WW	**260,352**	**846**	**56**	**40**
N3RS	256,985	692	53	50
W8FJ	182,880	537	54	42
NN3Q	179,910	923	53	37
W3FV	137,112	509	50	37
AA3B	123,710	452	54	35
K3NM	81,174	263	49	34
W3KWH	36,465	275	43	12
K3ND	33,046	122	36	26
K3CP	22,032	192	41	7
K3NZ	14,663	116	28	15
W3FVT	14,040	161	36	3
N3ZA	13,095	107	35	10
ALABAMA				
KS4YT	**28,304**	**185**	**42**	**16**
FLORIDA				
WS4Y	**159,068**	**576**	**53**	**38**
N8PR	41,262	145	42	27
GEORGIA				
W4ATL	**14,250**	**156**	**32**	**8**
N6MZ/4	13,761	48	2	31
KENTUCKY				
K4WW	**61,614**	**429**	**52**	**11**
NORTH CAROLINA				
NY4A	**362,202**	**1028**	**55**	**51**
K8AC	115,770	449	51	34
K3KO	69,768	313	51	25
AA4VV	18,148	75	28	24
W3GQ	5,766	81	27	4
TENNESSEE				
W4CBX	**187,824**	**860**	**55**	**31**
N4DW	170,283	616	55	38
N4VV	125,367	473	52	35
K4LTA	74,403	533	52	11
VIRGINIA				
KT3Y	**449,995**	**1069**	**58**	**57**
NR4M	442,652	1145	56	58
N4RV	133,855	340	53	42
W4PJW	119,624	611	53	23
WM3T	9,614	105	33	5
ARKANSAS				
WD5R	203,028	999	56	28
NEW MEXICO				
NA5NM	**304,336**	**1110**	**58**	**34**
N7KA	173,394	967	57	21
TEXAS				
N1LN	**223,590**	**1018**	**56**	**31**
K5NA	159,220	611	55	40
N3BB	67,044	345	49	25
K5IUA	61,920	352	51	21
W5PR	31,070	159	44	21
CALIFORNIA				
K6SE	**122,040**	**546**	**54**	**18**
KN6OX	62,552	485	51	5
N6KI	48,654	397	47	7
K6OQ	26,220	161	48	12
W6YRA	17,328	207	35	3
W4EF	13,860	118	35	10
ARIZONA				
N6SS	**169,412**	**628**	**55**	**27**
AB7E	115,513	768	56	11
N7KQ	92,820	558	56	14
W9NGA	65,720	399	51	11
MONTANA				
NW7O	**7,136**	**107**	**22**	**0**
UTAH				
N7JW	**379,659**	**1115**	**57**	**44**
K7OA	72,448	498	53	11
MICHIGAN				
W8UVZ	**294,143**	**968**	**57**	**50**
K8DD	129,402	685	54	25
OHIO				
W8FT	**214,830**	**963**	**56**	**34**
N8TR	112,112	370	54	37
WC8VOA	16,200	182	38	2
ILLINOIS				
WB9Z	**319,072**	**1149**	**58**	**46**
INDIANA				
W9IU	**142,524**	**841**	**53**	**21**
WB9CIF	50,236	200	52	24
WISCONSIN				
WØAIH	**192,879**	**930**	**56**	**31**
WT9Q	123,600	697	54	21
COLORADO				
KØSX	**111,090**	**711**	**56**	**13**
MISSOURI				
KØLIR	**128,800**	**818**	**56**	**14**
SOUTH DAKOTA				
KDØS	**100,380**	**626**	**55**	**15**

CANADA

PRINCE EDWARD ISLAND				
VY2ZM	**772,948**	**930**	**55**	**66**
QUEBEC				
VE2OJ	**229,356**	**678**	**53**	**16**
ONTARIO				
VE3RZ	**26,325**	**140**	**37**	**2**
ALBERTA				
VE6JY	385	11	7	0
BRITISH COLUMBIA				
VE7SV	**195,492**	**589**	**51**	**15**
TURKS & CAICOS				
VP5/VE3NE	**1,037,790**	**1460**	**55**	**62**

ASIA

ASIATIC RUSSIA

UA9AT	**450,944**	**755**	**1**	**63**
RT9W	392,645	703	0	59
RW9C	314,302	585	0	58
RK9CWB	262,440	484	0	60
UAØAGI	22,590	97	0	30
RU9CWG	13,846	61	0	32
JAPAN				
JA3YBK	**43,600**	**147**	**12**	**28**
JE1ZWT	20,039	118	7	22
JAØZRY	1,430	24	5	5
JORDAN				
JY9QJ	**362,398**	**604**	**5**	**57**

EUROPE

AUSTRIA				
OE2VEL	**63,918**	**223**	**3**	**50**
BELGIUM				
OR4N	**58,236**	**246**	**7**	**39**
BOSNIA				
T96Q	**816,584**	**1402**	**33**	**70**
CROATIA				
9A5Y	**1,033,818**	**1383**	**40**	**83**
9A1A	1,008,546	1413	36	82
9A7P	867,790	1344	35	75
CZECH REPUBLIC				
OL4HQ	**526,424**	**1084**	**26**	**66**
OL1A	**418,774**	**1007**	**20**	**62**
OL3Z	386,840	1015	12	64
OL4A	239,184	650	19	53
OL1C	232,715	796	9	52
OL4W	229,440	726	10	54
OK1KDO	147,441	635	5	44
OL9S	120,612	558	5	41
OK2OZL	51,400	273	1	39
ENGLAND				
G6PZ	**407,508**	**879**	**23**	**64**
G3TXF	123,552	332	16	50
G3WVG	63,504	127	19	53
ESTONIA				
ES5Q	**528,120**	**1221**	**10**	**71**
FINLAND				
OH1MA	**290,512**	**835**	**4**	**63**
OH6XX	193,343	632	5	54
OH4RH	57,892	277	0	41
OH1MM	21,216	125	0	34
FRANCE				
F6IRA	**666,536**	**1020**	**40**	**64**
GERMANY				
DL6FBL	**793,728**	**1284**	**38**	**79**
DL6RAI	**635,580**	**1261**	**31**	**68**
DAØBCC	482,209	1091	23	68
DLØMB	364,038	859	23	63
DL7ZZ	336,685	819	16	69
DL9YX	335,385	775	21	66
DJ6TK	305,368	846	12	64
DF3CB	278,073	696	17	64
DKØIW	235,756	748	13	55
DLØOV	214,540	663	15	53
DL8DYL	187,128	537	12	60
DH1NFL	172,368	684	6	50
DL1WA	168,084	620	9	49
DJ2MX	160,105	452	12	59
DFØSAX	130,851	393	13	54
DK1MM	80,789	398	2	42
DL4MM	80,520	226	13	53
DJ5CL	68,808	310	4	43
DLØDYW	55,170	260	4	41
DL1IAO	36,200	194	2	38
DL8NFU	32,955	188	0	39
DH1NHB	22,338	149	0	34
DJ2NR	8,944	76	0	26
DC1NNN	8,100	72	0	25
HUNGARY				
HG3DX	**935,532**	**1334**	**34**	**83**
HA5A	733,644	1222	29	79
HG1S	593,952	1177	27	69
HA8KAZ	265,052	771	11	56
ISLE OF MAN				
MD4K	**1,010,004**	**1760**	**32**	**70**
ITALY				
I5JVA	928,116	1318	39	77
I4EAT	786,932	1185	36	77
IV3SKB	520,975	1042	29	62
IKØYUT	488,894	933	27	67
IV3FHH	184,730	618	10	48
IK2CIO	91,930	284	14	44
KALININGRAD				
RW2F	**706,548**	**1301**	**18**	**79**
LATVIA				
YLØA	**177,650**	**625**	**4**	**51**
LITHUANIA				
LY9Y	**592,228**	**1195**	**20**	**71**
LY4A	389,684	998	9	65
LY7A	287,105	850	7	58
LY2XW	127,350	501	2	48
LUXEMBOURG				
LX5A	**874,956**	**1523**	**29**	**73**
LX7I	445,536	972	27	57
NETHERLANDS				
PI4COM	**395,910**	**884**	**19**	**64**
PI4DEC	377,069	932	19	58
PC5M	224,770	595	18	52
PI4CC	39,522	180	6	36
PI4ALK	26,928	161	0	34
PI9SRS	21,624	126	0	34
POLAND				
SP4PBI	**288,178**	**775**	**7**	**64**
SP2YNC	217,920	704	7	53
SN8F	194,370	683	4	53
SP3KFH	138,913	518	0	53
SN3U	91,862	401	2	44
3ZBIMA	72,576	342	1	41
SP9KRT	34,200	173	0	40
ROMANIA				
YR2I	**487,858**	**1000**	**24**	**62**
RUSSIA				
RU1A	**714,168**	**1198**	**29**	**80**
RN6BN	645,015	1053	26	79
RK4UWR	412,427	866	10	73
RL3A	389,592	1028	0	72
UA3DPX	237,840	717	2	62
RA3AJ	164,820	553	5	55
RZ1QZZ	134,995	566	0	49
SERBIA AND MONTENEGRO				
YZ7A	**607,365**	**1098**	**29**	**70**
SLOVAKIA				
OM7M	**916,864**	**1347**	**34**	**82**
OM8A	916,695	1336	34	83
OM3ROM	127,041	544	4	43
OM3KZA	74,605	346	1	42
SLOVENIA				
S59DCD	**322,275**	**805**	**17**	**58**
S50U	100,352	272	12	52
SPAIN				
EA1WX	**390,280**	**826**	**30**	**51**
EA4DAT	33,120	159	9	34
SWEDEN				
SM6DOI	**174,765**	**544**	**8**	**53**
SWITZERLAND				
HB9EP	**40,560**	**204**	**1**	**37**
UKRAINE				
UU7J	**898,876**	**1219**	**35**	**89**
UU4JWR	9,101	95	0	19
WALES				
GWØGEI	40,902	142	10	41

OCEANIA

HAWAII				
KH6GP	**92,988**	**227**	**34**	**8**
NEW ZEALAND				
ZL8QH	**34,144**	**115**	**25**	**7**

CW CHECKLOGS

Thanks to the following stations for their valuable CW checklogs: D44AC, DJ9BX, EU1SA, EY8CQ, F5CT, HAØLG, HA7UG, K4JRB, KK7DP, LA7SI, N6NC, NE9A, NNØG, OK1DMP, OK1HX, OK1YM, OK2CLL, OK2SG, OM1AW, PAØDVM, PA3AQL, RK4FF, SM5FUG, SP6CIK, SP7FGA, SP7HQ, SP8HKT, SP8YED, UA1RG, UR5EFJ.

SSB RESULTS

SINGLE OPERATOR

NORTH AMERICA

UNITED STATES

CONNECTICUT				
K1PX*	**133,196**	**829**	**54**	**17**
K1KI	**100,100**	**367**	**49**	**28**
W1CTN*	55,900	335	44	21
W1AMF*	24,120	252	32	8
K1BV*	10,605	128	31	4
KE1LI	9,316	122	31	3
W1AAD*	6,076	95	26	2
WØBR*	3,050	52	22	3
N1ZN*	2,070	50	18	0
KB1CIW*	1,740	39	20	0
W1JQ*	1,648	41	15	1
MASSACHUSETTS				
N1SV	**73,780**	**347**	**43**	**27**
W1BYH*	**42,612**	**328**	**39**	**14**
N1QDX*	30,296	188	39	17
WG1Z*	28,724	278	36	7
K1SND*	27,300	281	38	4
W1FJ	19,350	143	27	16
K5ZD	17,204	139	36	10
N3KCJ*	8,064	111	30	2
N1HTS*	6,084	98	23	3
WO1N	5,936	97	28	0
N1XS*	1,425	37	15	0
K1EP*	32	4	4	0
MAINE				
K1JB	**28,371**	**209**	**40**	**9**
N1LW*	**20,629**	**167**	**37**	**12**
W1CEK/QRP	900	27	15	0
NEW HAMPSHIRE				
AF1T	**94,608**	**528**	**48**	**25**
K1HAP	72,200	315	47	29
W1MKY	17,595	154	33	12
W1DAD*	2,812	65	19	0
N1IW*	2,520	51	20	1
WA1ZYX*	1,744	47	16	0
RHODE ISLAND				
KD1IA	**46,116**	**281**	**46**	**17**
W1YRC	30,024	124	42	12
KI1G	23,814	210	27	15
AJ1M	7,592	128	23	3
VERMONT				
K1KD*	**57,570**	**440**	**49**	**8**
NEW JERSEY				
NQ3N	**52,676**	**445**	**43**	**9**
N2MR	32,396	266	42	10
W2DO	29,697	209	42	15
W2CG	24,024	173	37	15
W1GD	12,408	102	33	11
N2ED	12,190	101	37	9
K2YLH*	**9,600**	**128**	**28**	**4**
WV2ZOW*	4,410	93	21	0
K2SZ*	4,185	67	25	2
WI2Q*	3,750	69	25	0
KB2MN*	1,411	37	17	0
NEW YORK				
K3QDV	**47,846**	**449**	**42**	**5**
WA2JQK*	**44,022**	**324**	**45**	**13**
NA2P	40,858	254	43	19
N2MTG*	22,181	245	37	4
N1EU	21,217	158	33	16
NA2M	12,565	157	33	2
N2BZP*	11,376	131	30	6
K2YR*	10,080	108	31	5
W2JUV*	6,136	103	26	0
W2CXM*	2,196	49	18	0
				(WD9S)
NJ1F*	1,802	41	17	0
K2TV*	1,246	40	14	0
DISTRICT OF COLUMBIA				
W3DOS*	560	25	10	0
MARYLAND				
N3HBX	**193,725**	**1138**	**57**	**18**
W9GE	96,070	657	52	13
W3LL*	**54,860**	**474**	**45**	**7**
N3UM	44,916	332	43	14
K3ZO	40,448	187	38	26
W3ARS*	38,688	321	42	12
AK3E*	22,837	246	36	5
K1RH	22,000	250	35	5
WK3H*	21,000	223	37	5
W3BW	20,072	135	36	16
W3DF	9,690	113	29	5
K3TW/QRP	**3,780**	**50**	**27**	**3**
PENNSYLVANIA				
W3GH	**241,632**	**1005**	**59**	**37**
W3BGN	**209,856**	**778**	**57**	**39**
W3TS	161,226	880	55	23
K3NM	110,884	575	49	27
W3TDF	54,550	463	39	11
W3SO	50,380	416	49	6
		(Op: W3YOZ)		
K4JLD*	**32,547**	**222**	**42**	**15**
K3NZ	27,440	183	40	16
K3SWZ*	21,195	202	37	8
K3MD	16,400	157	32	9
N3NR	13,416	137	32	7
W3AP	9,702	122	28	5
W3UHP*	9,438	140	32	1
AA3TL	2,508	48	21	1
W3AG/QRP	363	15	11	0
ALABAMA				
K4WI*	**70,053**	**551**	**44**	**13**
KA1DWX	43,745	278	48	17
K4VU*	10,184	118	33	5
FLORIDA				
W4SVO	**134,725**	**591**	**53**	**32**
AA4MM	89,991	396	50	31
K9HUY	45,371	312	42	17
NJ2F	26,040	171	38	18
AA4RX*	**10,783**	**111**	**35**	**6**
W4SAA*	9,750	102	30	9
N4EK*	8,448	112	27	6
K9ES	8,436	76	24	13
		(Op: K3ZM)		
K1EY	4,110	51	21	9
KG4MWO*	3,105	53	26	1
W8IM*	176	11	8	0
GEORGIA				
N4PN	**214,808**	**1040**	**56**	**32**
WA4TII	**148,732**	**839**	**52**	**24**
N4NX	110,916	588	55	24
WY4Y	41,876	316	45	13
		(Op: N4EIL)		
K4EA	36,656	242	40	18
K4BAI	35,775	192	44	9
W4AMP*	1,003	28	16	1
KI4ASK	688	20	16	0
KENTUCKY				
W4LJM	**75,686**	**454**	**55**	**16**
NB4K*	**38,394**	**314**	**48**	**6**
N4GN	22,172	213	43	3
NORTH CAROLINA				
K3KO	**49,400**	**322**	**49**	**16**
N4XD	46,620	306	40	20
N2BT	43,859	312	48	13
NX9T	39,615	300	46	11
W4TMR/QRP	**23,177**	**216**	**43**	**6**
N4UH	18,650	149	49	10
K4WES*	**15,312**	**142**	**35**	**9**
KG4NEP*	8,349	116	31	2
AA4GR*	7,945	96	30	5
W4ZV	115	6	4	1
SOUTH CAROLINA				
K4CNW*	**52,838**	**403**	**46**	**12**
N2FY	20,246	158	43	10
NC4SC	16,740	161	37	8
KR1ST/QRP	**2,436**	**55**	**21**	**8**
TENNESSEE				
W4PV	**109,344**	**716**	**54**	**14**
K4JNY	92,560	635	48	17
WB4YDL	73,332	531	53	10
WA4JA/QRP	**30,250**	**248**	**47**	**8**
WN4M*	**25,560**	**250**	**39**	**6**
NA4K	23,276	226	42	4
W6DSQ/QRP	9,906	118	36	3
W4NZ*	8,853	100	36	3
K4RO	3,750	61	30	0
W4OGG	1,500	33	17	3
K4AMC	1,020	30	17	0
W4BCG*	799	22	17	0
WA4QSD*	198	11	9	0
WA4GLH*	154	11	7	0
VIRGINIA				
W4MYA	**333,036**	**1333**	**59**	**40**
W4DR	**107,957**	**356**	**50**	**39**
WK4Y	86,304	604	47	15

WØYR	68,628	513	42	15
K4JA	54,306	344	44	19
K4ZW	39,088	285	43	13
N4DWK*	**28,188**	**213**	**41**	**13**
N4BCC*	23,144	236	39	5
W3BP	20,202	214	31	8
K4RDU	17,116	169	38	6
N4MM*	16,807	135	39	10
KB4OLM*	11,653	119	38	5
AD4TJ*	11,220	141	30	4
WM3T*	9,858	150	30	1
KU4FP*	8,096	106	26	6
W2YE	5,363	66	25	6
KI3O*	4,300	77	24	1
K4EU*	4,140	84	23	0
K4GM*	3,772	76	21	2
W4IM*	1,750	58	14	0
N4JED*	168	12	7	0
LOUISIANA				
NA5O*	848	25	15	1
MISSISSIPPI				
NI5F*	**9,386**	**113**	**36**	**2**
N5PA	6,895	85	29	6
W5THT	1,596	25	16	5
NEW MEXICO				
N6ZZ	**18,612**	**176**	**40**	**7**
OKLAHOMA				
W5TM	**124,392**	**765**	**55**	**18**
			(Op: W5AO)	
TEXAS				
K5RX	**236,124**	**1209**	**57**	**27**
W5PR	**140,866**	**772**	**54**	**24**
K5NZ	39,353	285	50	9
NØRQ	13,455	122	36	9
W5MPX*	**9,374**	**93**	**38**	**5**
K5BG	8,460	106	34	2
KC5OEG*	7,995	86	36	5
N5VK	4,906	60	30	1
K5SF*	1,672	35	22	0
W5DBK*	80	8	5	0
CALIFORNIA				
K6TQ	**55,005**	**430**	**50**	**7**
K6KDK	33,400	298	47	3
N6AA*	**26,028**	**203**	**45**	**9**
KB7Q*	22,308	189	46	2
K6SE	22,110	157	43	12
N6NF*	21,291	204	44	3
N6RO	18,081	195	39	2
W6RKC	11,562	120	38	3
W6HG	6,200	88	29	2
W6JK*	4,788	78	27	1
AA6EE*	2,750	52	24	1
WA5VGI	2,679	63	17	2
W6ISQ	2,438	47	21	2
KE6QR*	2,100	64	14	1
K6LRN	1,218	39	13	1
KU6T*	768	29	11	1
W6UE*	637	20	21	2
			(Op: N6AN)	
K6IPV	620	28	9	1
W6RTW*	150	11	6	0
ARIZONA				
NF7E	**41,325**	**326**	**49**	**8**
KJ7WY	39,176	288	49	10
W7YS	5,984	82	32	2
KA7TDH	5,280	82	29	1
IDAHO				
KØTO	**33,456**	**314**	**45**	**3**
KE7RT*	**19,355**	**172**	**45**	**4**
MONTANA				
KS7T	**39,368**	**319**	**51**	**5**
K7BG	8,316	101	33	3
NEVADA				
K7ACZ*	**2,920**	**67**	**19**	**1**
N7ON*	649	25	10	1
OREGON				
W7OR*	**13,767**	**160**	**37**	**2**
W3CP*	4,200	69	26	2
UTAH				
KF7IQ	374	17	11	0
WASHINGTON				
WA7LT	**85,248**	**586**	**52**	**12**
K7RL	44,874	359	47	7
W7WKR*	**26,352**	**249**	**46**	**2**
W7NNN	25,760	243	40	6
K7UIR	14,924	161	39	2
N7LOX	12,122	143	37	1
K7AWB*	5,916	78	34	0
W9PL	5,460	79	29	1
W7SAW*	3,915	62	27	0
KA7GEK*	1,224	33	17	0
WA6AWD*	390	18	10	0
WYOMING				
WA2IZL	**69,502**	**524**	**51**	**8**
KO7X*	2,139	42	23	0
WB4UIC*	290	13	10	0
MICHIGAN				
W8MJ	**85,743**	**605**	**54**	**9**
N8OL	66,000	501	52	8
N8LJ	51,840	381	52	8
W8JWN	24,751	205	48	5
K8YTO	6,405	74	33	2
K8GT*	4,806	80	27	1
K8GVK*	4,669	70	28	1
NF8M*	1,035	30	15	0
OHIO				
ND8DX	**216,999**	**1170**	**58**	**23**
NØFW*	**196,710**	**987**	**56**	**27**
K8FH*	50,814	426	48	6
K8NVR*	50,085	429	45	8
W8DD*	26,864	258	39	7
N8OH*	22,800	245	35	5
NA8W*	21,267	179	43	8
W8KNO*	18,396	201	39	3
WA8TNO	11,045	90	37	10
K8BL*	10,992	99	34	9
K8MR*	10,272	141	31	1
N8XA/QRP	**5,796**	**99**	**28**	**0**
AF8C*	3,266	62	23	0
KC8UDV*	2,714	53	23	0
W8EH*	1,008	25	18	0
WEST VIRGINIA				
W5GFR	**149,682**	**825**	**56**	**22**
N8II	107,184	695	46	20
K2UOP	104,453	675	52	15
N4SEA	29,583	219	47	10
ILLINOIS				
WB9Z	**351,916**	**1542**	**59**	**38**
N2BJ	62,370	521	50	5
K9FO*	**50,112**	**386**	**51**	**7**
K9IDQ	40,260	324	47	8
K9FY	38,760	283	51	9
AB9H	38,070	311	47	7
K9MMS*	20,962	199	42	5
W9LYN*	14,749	152	40	3
K9QVB*	12,432	127	37	5
K9YC*	11,232	144	35	1
KG9N	10,840	111	32	8
K9IJ*	7,175	74	39	2
N9JZ/M*	4,424	73	28	0
W9SE/QRP	**1,938**	**45**	**19**	**0**
AA9RT*	3	57	26	1
INDIANA				
K9SG	**145,084**	**843**	**56**	**20**
WT9U*	45,485	376	48	7
N9DR*	22,389	187	42	9
N9LF*	8,995	118	33	2
WB9NOO*	6,270	100	30	0
W9RE*	4,088	67	26	2
KB9STQ*	1,224	36	17	0
N4TZ*	1,116	31	18	0
WISCONSIN				
K9UW	**55,495**	**455**	**50**	**5**
WA9TZE	54,810	313	57	13
KØPJ*	**51,545**	**369**	**51**	**10**
KB9Q*	27,936	264	44	4
K9TY	19,329	173	49	2
K9VS*	19,024	217	41	0
N9OX*	8,262	111	33	1
WA9IRV	2,760	51	23	0
COLORADO				
KØGAS	**45,885**	**362**	**51**	**16**
KØRI/QRP	**15,925**	**146**	**43**	**6**
KKØQ/QRP	10,363	110	41	2
KBØYH/QRP	4,719	67	32	1
NØHF*	4,046	52	32	2
KIØII/QRP	3,483	57	24	3
IOWA				
KØIO*	**9,840**	**111**	**38**	**2**
KBØBUV*	9,065	112	36	1
KIØHA	10,332	110	36	5
AE9B	17	150	42	7
NEBRASKA				
KBØARZ*	**12,900**	**141**	**41**	**2**
CANADA				
NEWFOUNDLAND				
VO1TA	**24,200**	**90**	**26**	**18**
VO1AU	1,452	15	2	10
PRINCE EDWARD ISLAND				
VY2ZM	**890,370**	**1237**	**57**	**60**
			(Op: K1ZM)	
NEW BRUNSWICK				
VE9WH*	**5,453**	**61**	**18**	**1**
QUEBEC				
VE2UMS	**65,436**	**336**	**36**	**5**
			(Op: VE2FAB)	
ONTARIO				
VA3KA	**407,744**	**864**	**56**	**36**
VE3PN	**236,850**	**631**	**50**	**25**
VA3MO	205,854	642	52	14
VE3NE	77,427	249	47	16
VE3MGY/QRP	**63,495**	**293**	**43**	**2**
VE3KP*	**43,516**	**196**	**38**	**8**
VE3AGC*	42,517	220	36	5
VA3NR*	29,664	172	34	2
VE3XAT	27,004	129	35	8
VE3DZ*	25,456	124	36	7
VE3BNO*	23,649	122	32	7
VE3KZ	22,815	122	35	4
VA3IX*	19,008	120	31	2
VE3EJ	15,136	99	27	5
KANSAS				
WØNO	**139,230**	**900**	**57**	**13**
KØRH*	**96,192**	**686**	**53**	**11**
NØAG*	40,068	344	47	7
AAØMZ*	23,479	199	47	6
MINNESOTA				
KØTT	**87,904**	**572**	**55**	**12**
KTØR	66,906	473	53	10
KSØT*	**30,912**	**239**	**50**	**6**
KØKX*	27,694	179	49	12
K4IU	17,664	169	45	3
ACØW*	15,910	164	40	3
WA2MNO*	13,684	139	42	2
KØAD*	10,290	106	40	2
NØAT*	3,024	50	26	1
WØHW*	2,700	48	24	1
KØVG	2,626	43	25	1
NØKBD*	1,980	36	21	1
MISSOURI				
KØJPL	**58,496**	**405**	**53**	**11**
VE3BHI*	5,635	52	23	0
VE3RCN*	4,980	54	20	0
VA3SWG*	2,584	29	19	0
SASKATCHEWAN				
VA5DX	**204,930**	**612**	**55**	**14**
ALBERTA				
VE6SF	**32,095**	**139**	**40**	**9**
VA6MM	3,400	43	17	0
BRITISH COLUMBIA				
VE7FO*	**8,740**	**98**	**48**	**1**
VA7MJR*	288	15	4	0
BERMUDA				
VP9GE*	**31,390**	**142**	**32**	**11**
COSTA RICA				
TI2KAC*	**8,580**	**49**	**21**	**12**
CUBA				
CO8KA*	**43,554**	**170**	**38**	**13**
CO8LY*	2,160	25	8	8
DOMINICAN REPUBLIC				
HI3TEJ*	**134,550**	**334**	**45**	**30**
HI3NR*	3,740	34	7	13
HONDURAS				
HR1RBM*	2,470	24	8	11
MARTINQUE				
FM5GU	**282,720**	**545**	**50**	**43**
MEXICO				
XE2TG*	**43,797**	**226**	**34**	**5**
XE1V	20,958	98	31	11
PUERTO RICO				
KP4KE*	**311,505**	**606**	**55**	**40**
			(Op: DK8ZB)	
NP4VO/QRP	**24,432**	**99**	**31**	**17**
ST. KITTS				
V47KP	**391,206**	**579**	**52**	**61**
			(Op: W2OX)	
St. MARTIN				
PJ7/W8EB	360	9	5	3
US VIRGIN ISLANDS				
KV4FZ	**273,564**	**468**	**53**	**49**
WP2Z	54,120	163	37	23
			(Op: N2TK)	
AFRICA				
CANARY ISLANDS				
EA8AN*	**46,403**	**104**	**13**	**36**
CAPE VERDE ISLANDS				
D4B	**904,012**	**778**	**47**	**70**
			(Op: 4L5A)	
EGYPT				
SU9AM*	**5,700**	**30**	**0**	**19**
MOROCCO				
CN2R	**1,028,508**	**906**	**44**	**70**
			(Op: W7EJ)	
ASIA				
ASIATIC RUSSIA				
RA9MJ	**97,211**	**307**	**0**	**41**
RL9F	70,004	168	0	44
UA9SPY*	**20,940**	**75**	**0**	**30**
RW9QA*	12,351	73	0	23
RAØALM	756	10	0	9
CYPRUS				
C4M	**139,850**	**286**	**1**	**49**
KYRGYSTAN				
EX8AA	**1,755**	**22**	**0**	**19**
EUROPE				
ALAND ISLANDS				
OHØNL	**151,449**	**506**	**2**	**55**
			(Op: OH2BYS)	
AUSTRIA				
OE9MON	**63,710**	**270**	**4**	**42**
OE8YDQ	18,360	101	1	35
OE8CIQ	17,424	104	1	32
OE1TKW*	825	15	0	11
AZORES				
CU3AN*	1,300	17	1	12
BELARUS				
EU1AZ	**61,576**	**275**	**0**	**43**
EW2BX*	**28,186**	**166**	**0**	**34**
EW6OO*	9,288	76	0	24
BELGIUM				
ON4WW	**309,048**	**749**	**16**	**63**
OR4N*	**62,006**	**289**	**1**	**42**
			(Op: ON4ACA)	
BOSNIA				
T94LW*	**20,864**	**126**	**0**	**32**
BULGARIA				
LZ2DF*	**24,228**	**134**	**0**	**36**
LZ1AQ	20,202	105	0	37
LZ2UZ*	12,025	95	0	25
CROATIA				
9A7ZZ	**64,413**	**243**	**0**	**43**
9A3RE*	**12,780**	**84**	**1**	**29**
CZECH REPUBLIC				
OK1RI	**351,272**	**872**	**20**	**56**
OK1TP	**100,008**	**380**	**9**	**45**
OK2PMS*	**61,418**	**316**	**1**	**40**
OK2AB*	55,224	303	0	39
OK1FC*	40,520	210	0	49
OK2BEN*	36,408	184	1	40
OK2BQL*	34,040	177	1	39
OK1KZ*	26,144	150	1	37
OK1MJA*	19,550	123	1	33
OK1FDY	19,180	116	0	35
OK2BZM*	10,272	97	0	24
OK1IF/QRP	**10,088**	**86**	**0**	**26**
OK1DOY*	1,794	30	0	17
DENMARK				
OZ1DD	**286,348**	**814**	**6**	**62**
OZ1HXQ	144,760	512	5	50
OZ4O	22,050	118	0	37
ENGLAND				
G6M	**101,847**	**416**	**3**	**48**
			(Op: M3WKR)	
G3VAO*	**72,346**	**220**	**11**	**50**
G3SVL	62,220	242	4	47
M3RCV*	2,768	37	0	16
ESTONIA				
ES5RIM*	1,920	24	0	16
FINLAND				
OH2PM	**91,603**	**382**	**1**	**46**
OH6NIO*	**30,873**	**146**	**0**	**41**
OH5NE	28,980	162	0	35
OH2BO	26,866	139	1	37
OH2KI	378	10	0	7
OH1BOI*	51	4	0	3
FRANCE				
F5BBD	**102,548**	**297**	**12**	**50**
F5JFU	20,459	90	4	37
F6GOX	14,840	84	1	34
GERMANY				
DJ4PT	**326,655**	**805**	**19**	**66**
DK6WL	**163,410**	**559**	**11**	**54**
DF9ZP	149,296	551	10	52
DK2OY	97,405	393	3	52
DF3KV*	**78,210**	**327**	**4**	**51**
DL5KUT	63,752	274	3	49
DJ5MW	54,135	292	4	41
DL9NDS*	51,216	281	5	39
DJ8UV*	43,017	284	0	39
DJ6TK*	33,442	160	3	43
DB8NI*	26,985	188	0	35
DM2AWM*	25,236	168	1	35
DL3LAB	24,486	186	0	33
DJ5IW	20,922	158	1	32
DH8AF*	19,032	105	1	38
DLØSHZ*	18,278	114	0	37
			(Op: DL1ASR)	
DL2RMC*	17,136	115	1	33
DL4WA*	16,980	139	0	30
DJ2YE*	15,648	113	0	32
DL4NN*	14,670	120	0	30
DJ3LE*	14,477	116	0	31
DG6NBD*	12,840	100	0	30
DF8AA*	11,718	83	0	31
DKØFY*	11,610	106	0	30
			(Op: DF9ZP)	

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yeah, right.

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DL6RBH*	9,352	83	0	28
DK1FW*	9,150	74	0	30
DL4NER*	8,148	70	0	28
DG9NDU*	6,912	61	0	27
DLØPAF*	4,000	52	0	20
DJØGM*	3,900	37	0	20
DL3SCN*	3,420	44	0	19
DK3YD*	3,211	38	0	19
DH5AO*	2,533	34	0	17
DKØMN*	2,232	29	0	18
DK1MAX	2,227	20	0	17
DJ3GE/QRP	913	25	0	11
DF2LH*	648	18	0	9
GREECE				
SY8A	**314,175**	**877**	**7**	**64**
		(Op: SV8CS)		
SV1GRD	18,864	103	0	36
SV1DPI	14,904	81	0	36
SV1BFW	13,756	67	1	37
HUNGARY				
HA8BE	**81,400**	**364**	**3**	**41**
HA1CW*	**32,320**	**165**	**2**	**38**
HA1DAE*	28,310	147	1	37
IRELAND				
EI2JD	**160,860**	**579**	**8**	**52**
EI9JN*	**10,920**	**71**	**2**	**28**
ITALY				
IV3TMV	**146,068**	**554**	**2**	**51**
IZ4DPV	144,996	509	3	54
IK8UND	58,800	244	1	48
I7/9A3A	3,717	36	0	21
IK2AQZ*	3,340	33	0	20
LATVIA				
YL2KF	**90,052**	**364**	**2**	**45**
YL1ZJ*	**53,218**	**254**	**1**	**40**
YL1ZS	25,305	145	1	34
LITHUANIA				
LY4A	**550,314**	**1209**	**13**	**73**
		(Op: LY2FY)		
LY3UM	93,126	351	4	47
LY2DU	77,664	313	1	47
LY3BA*	**16,005**	**98**	**0**	**33**
LY2GW*	1,122	24	0	11
LUXEMBOURG				
LX1NO*	**12,160**	**74**	**0**	**32**
MOLDOVA				
ER3HW*	**107,180**	**447**	**3**	**43**
N. IRELAND				
GIØOUM*	1,320	24	0	11
NETHERLANDS				
PA3GCV	89,376	290	10	46
PAØJM*	**22,237**	**123**	**0**	**37**
PAØMIR*	17,353	91	2	35
PA3GGW*	9,624	80	0	24
PA3GVI*	2,584	31	0	17
NORWAY				
LA7AK	**10,920**	**84**	**0**	**26**
LA1K	100	5	0	4
		(Op: LA1ZNA)		
LB1LF*	5	1	0	1

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POLAND				
SP6A	**90,558**	**326**	**11**	**43**
SP6CZ	81,810	302	7	47
SO8N	51,557	251	1	42
			(SQ8GHY)	
SP3GXH	36,630	213	2	35
SP3OL*	**26,904**	**148**	**0**	**38**
SP3BLT/QRP	**22,295**	**133**	**0**	**35**
SP6CIK*	21,723	112	1	38
SQ9UM*	21,440	143	0	32
SP3FLQ*	21,012	126	1	33
SQ9IDE*	20,429	141	0	31
SN1EG*	18,864	111	0	36
SQ2EAN*	18,352	127	0	31
SP9HZF/QRP	12,276	83	0	31
SP6HRK*	11,052	58	1	35
SP1RW*	10,890	76	1	29
SP6GTN	10,432	73	0	32
SP9W/QRP	10,114	82	0	26
SP1DTG*	8,481	50	0	33
SP4LVK*	8,376	77	0	24
SP4COU*	8,036	57	0	28
SP3GTS	6,808	64	0	23
SQ9IET*	4,360	46	0	20
SQ9ITM*	4,180	43	0	20
SQ8T*	3,360	49	0	15
SP4AAZ*	3,173	37	0	19
SN5J*	2,340	24	0	20
		(Op: SP5JXK)		
SP4AVG*	1,276	25	0	11
PORTUGAL				
CT1FJK	**118,008**	**285**	**30**	**58**
CT1EAT	67,056	159	19	47
CT1ILT	45,864	159	10	42
CT1AL	13,299	82	0	33
CT1ETL*	371	11	0	7
ROMANIA				
YO5OHZ	**110,722**	**476**	**1**	**45**
YO2RR	52,800	234	4	40
YO5OED*	**22,890**	**129**	**0**	**35**
YO5BYV*	20,757	124	0	33
YO4GDP*	5,865	51	0	23
YO3CZW*	5,214	47	0	22
RUSSIA				
RK4FD	**124,174**	**577**	**0**	**47**
UA3AKO	82,663	366	0	49
RV1CC	79,128	350	0	47
RA6AFB	54,418	242	0	46
RN4AA	41,151	191	0	53
RN3ZC	38,220	204	0	39
RA6DB	31,119	155	0	41
UA3BL/QRP	**29,304**	**175**	**0**	**36**
RA4HBS*	**19,764**	**112**	**0**	**36**
RA6LBS	19,608	98	0	36
RU3ZI*	18,938	114	0	34
RZ3VA*	18,394	117	0	34
UA4FMU*	17,732	119	0	31
RX3QDF*	16,678	115	0	31
RX3AEX	9,099	73	0	27
RA3DNC	8,874	64	0	29
RA3VR*	5,214	54	0	22
RK6ATQ*	3,502	43	0	17
UA3LHL/QRP	2,688	36	0	16
RU6FA*	2,176	30	0	15
RA3WNS/QRP	688	22	0	8
SERBIA & MONTENEGRO				
YU7AV	**221,056**	**670**	**8**	**56**
4N7ZZ*	**57,420**	**251**	**1**	**44**
YU1ZZ*	16,736	103	0	32
4N6ØØA*	270	9	0	6
		(Op: YU1RA)		
SLOVAKIA				
OM2VL	**235,648**	**716**	**6**	**58**
OM6TX*	**43,720**	**217**	**1**	**39**
OM4APD*	18,117	110	0	33
OM3TLE*	6,237	60	0	21
OM1AW*	3,402	31	1	20
SLOVENIA				
S57M	**247,151**	**665**	**13**	**58**
S57DX	172,425	622	7	48
S5ØA	57,246	234	9	38
S54X*	**40,482**	**210**	**0**	**39**
S5ØO	29,868	160	1	37
S51NZ*	21,793	119	1	36
SPAIN				
EA5EG	**55,283**	**172**	**8**	**51**
EA3BT	42,532	163	8	41
EA3GHQ*	**36,331**	**145**	**2**	**45**
EA3EGB/QRP	**18,019**	**96**	**2**	**35**
EA3FF*	16,014	88	3	31
EA3AON	13,468	68	2	35
EA3AMS*	7,364	62	0	28
EA1DVY*	3,887	27	2	21
EA1DDU*	1,288	18	0	14
EA7RM*	828	14	0	12
SWEDEN				
SM7E	**31,502**	**163**	**1**	**27**
		(Op: SM7BHM)		
SM5Z	24,280	116	1	39
		(Op: SM5BPJ)		
SM6IQD*	4,440	45	0	20
SM1TDE	200	8	0	5
UKRAINE				
UT7DK	**124,280**	**516**	**3**	**49**
UT3SA*	**115,805**	**435**	**3**	**50**
UR5MMZ*	52,624	231	1	45
UT5DL*	43,868	203	1	43
UR4MBI/QRP	**32,727**	**171**	**0**	**39**
UR7M	19,550	117	0	34
US7IA*	12,796	99	0	28
UR5ZLK*	12,684	97	0	28
UT5UGR	11,136	79	0	29
US2WU*	6,400	52	0	25
UT7GX*	3,723	50	0	17
US5IND/QRP	2,848	44	0	16
UT1ZZ*	210	8	0	5
WALES				
GW4BLE	**64,232**	**209**	**10**	**46**

SOUTH AMERICA

ARUBA				
P40W	**548,454**	**546**	**53**	**49**
		(Op: W2GD)		
BRAZIL				
PV8DX*	**2,192**	**16**	**7**	**9**
PY3CEJ	510	10	1	5
COLOMBIA				
HK6BRK*	**1,224**	**12**	**3**	**9**
PERU				
OA4WW	4	2	0	1
		(Op: OHØXX)		
VENEZUELA				
YV2IF*	**51,870**	**86**	**36**	**29**
YV5LIX	31,570	83	23	18
YV5MBX*	945	11	3	6

SSB MULTI-OPERATOR

NORTH AMERICA

UNITED STATES

CONNECTICUT				
NZ1U	**127,932**	**535**	**50**	**34**
NEW HAMPSHIRE				
WA1Z	**88,270**	**514**	**48**	**22**
NEW JERSEY				
N2CW	**260,736**	**1047**	**56**	**41**
K2FL	23,320	171	40	13
NA2U	1,056	30	15	1
NEW YORK				
NN2W	**120,870**	**614**	**54**	**25**
DELAWARE				
AA1K	**74,550**	**372**	**52**	**23**
MARYLAND				
K3DI	**112,322**	**670**	**56**	**15**
W3UL	22,575	231	38	8
PENNSYLVANIA				
WE3C	**246,729**	**1069**	**57**	**36**
K3WW	134,880	679	53	27
W3KWH	83,452	597	49	13
K3SV	40,920	235	47	19
W3FV	40,238	260	48	14
W3FVT	14,664	167	34	5
K3ND	9,618	72	28	14
GEORGIA				
N4GG	**28,616**	**209**	**44**	**12**
N4XMX	16,600	138	41	9
KENTUCKY				
K4UZ	**50,215**	**424**	**51**	**4**
K4WW	42,066	248	47	7
NORTH CAROLINA				
K4MA	**29,854**	**174**	**41**	**18**
W3GQ	19,300	161	40	10
SOUTH CAROLINA				
W4UNP	**31,801**	**227**	**46**	**13**
TENNESSEE				
N4VV	**64,218**	**401**	**48**	**18**
AG4V	18,360	145	47	7
K4BP	9,936	120	33	3
VIRGINIA				
N4RV	**84,252**	**351**	**55**	**29**
W4CA	65,065	536	44	11
K4YT	62,913	390	49	18
ARKANSAS				
WD5R	**130,480**	**841**	**57**	**13**
MISSISSIPPI				
W5CR	**28,080**	**239**	**42**	**10**
TEXAS				
AB5MM	**128,925**	**761**	**55**	**20**
CALIFORNIA				
KN6OX	**22,428**	**243**	**40**	**2**
W6YRA	4,114	89	21	1
ARIZONA				
N7GP	**151,050**	**889**	**54**	**21**
NJ7I	75,643	500	51	16
N7KQ	59,086	427	51	11
MONTANA				
NW7MT	**13,332**	**132**	**42**	**2**
WASHINGTON				
K7OX	**90,182**	**599**	**54**	**13**
WA7IVO	17,329	179	40	3
OHIO				
N8TR	**23,760**	**114**	**49**	**17**
N8KM	15,910	170	41	2
WC8VOA	15,884	161	39	5
WEST VIRGINIA				
K8OQL	**42,884**	**314**	**48**	**10**
INDIANA				
W9IU	**89,895**	**617**	**54**	**11**
COLORADO				
KØDU	**122,972**	**775**	**55**	**16**
MISSOURI				
WØCW	**207,168**	**1164**	**56**	**22**
WØVD	9,798	90	41	5

CANADA

ONTARIO				
VE3DC	**281,123**	**786**	**55**	**18**
ALBERTA				
VE6JY	**40,716**	**167**	**45**	**7**
BAHAMAS				
C6AWB	**96,120**	**312**	**46**	**14**
BELIZE				
V31MD	**214,320**	**550**	**52**	**24**
MEXICO				
XE1RCS	**527,616**	**1060**	**55**	**41**
TURKS & CAICOS				
VP5B	**678,855**	**1072**	**55**	**60**

ASIA

ASIATIC RUSSIA				
RK9JWV	1,233	15	9	9
GEORGIA				
4LØG	**443,712**	**948**	**1**	**47**

EUROPE

AUSTRIA				
OE2VEL	**116,348**	**374**	**10**	**49**
OE5QHO	40,775	232	0	35
OE5T	29,736	165	0	36
OE5XVL	25,272	138	0	36
CZECH REPUBLIC				
OL3Z	**140,391**	**491**	**9**	**48**
OL4W	79,380	364	2	43
OK1KMG	30,328	194	0	34
DENMARK				
OZ1ADL	**168,740**	**550**	**9**	**50**
ENGLAND				
G6PZ	**208,780**	**571**	**14**	**59**
G3UEG	141,644	395	14	54
FINLAND				
OH1MM	7,202	54	0	26
FRANCE				
F5PYJ	**93,100**	**378**	**3**	**46**
GERMANY				
DL6FBL	**466,970**	**1015**	**28**	**70**
DABBCC	**104,170**	**433**	**3**	**52**
DL2DBH	101,400	446	4	48
DL4GBA	74,872	363	4	45
DLØOV	70,110	367	3	42
DKØIW	62,089	303	3	46
DK1MM	62,040	306	0	47
DH4SBO	57,763	281	1	46
DL8OH	53,246	236	4	47
DH1NFL	49,286	333	0	38
DL4NAC	45,150	210	4	46
DL6RAI	40,590	205	3	42
DKØVD	34,650	181	4	38
DH1NHI	32,110	190	1	37
DF3CB	30,888	204	0	39
DLØAR	29,648	227	1	33
DLØDX	25,863	178	0	37
DJ9MH	25,420	142	3	38
DJ2MX	17,325	120	0	35
DL1NEO	16,731	123	0	33
DH1NHF	16,384	116	0	32
DKØNS	4,161	57	0	19
DLØTP	2,820	36	0	20
DLØZN	2,820	36	0	20
DL2MY	360	25	0	7
HUNGARY				
HG1S	**260,390**	**770**	**11**	**54**
IRELAND				
EI7M	**423,808**	**820**	**29**	**59**
ITALY				
IQØCV	**23,788**	**128**	**2**	**26**
LATVIA				
YLØA	**13,265**	**75**	**0**	**35**
LITHUANIA				
LY7A	**150,600**	**587**	**1**	**49**
NETHERLANDS				
PI4CC	**164,556**	**499**	**10**	**53**
POLAND				
SN2N	**124,491**	**498**	**1**	**50**
SP9KTL	98,627	440	0	46
SN6W	35,412	189	1	38
SP8YCB	31,710	193	0	35
SP3PKL	15,584	103	0	32
PORTUGAL				
CQ1A	**20,480**	**93**	**4**	**16**
SAN MARINO				
T77C	**442,416**	**1070**	**15**	**63**
SERBIA & MONTENEGRO				
YZ7A	**160,888**	**557**	**2**	**54**
SPAIN				
EA5AT	**127,374**	**335**	**15**	**56**
SWEDEN				
SM6CNN	**20,330**	**103**	**8**	**38**
7S6N	420	14	0	6
SWITZERLAND				
HB9CXZ	**241,431**	**677**	**10**	**59**
HB9LC	17,358	102	3	30
UKRAINE				
UU7J	**548,152**	**1396**	**10**	**78**
UZ4E	5,957	53	0	23

SSB CHECKLOGS

Thanks to the following stations for their valuable SSB checklogs: CT3FQ, D44AC, DL6RO, EA5AJX, ER2G, IØKHP, K9JS, KS9SSS, N7DCS, OH2LZI, OK1YM, PAØLOU, PAØRBO, PA1V, PA5TT, PG7V, SP3BVA, SP5BYC, UA1AKE, UA3OQ, UA4RC, UA9CLB, W3YVV, W4BCV.

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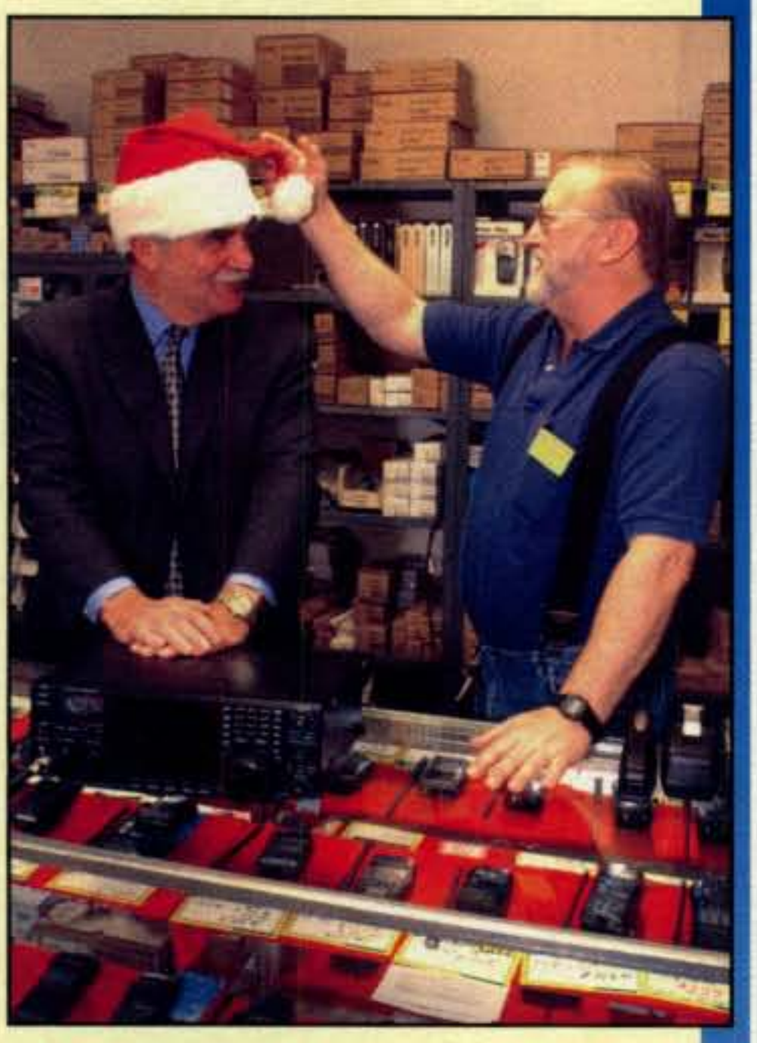

He may not have the full red and white suit, or the "physique" for the job, but to many hams, the man in the hat in our cover photo *is* Santa Claus, or at least one of his prime helpers! He's Bob Ferrero, W6RJ, Founder and Owner of Ham Radio Outlet, who makes sure lots of nice ham radio toys are in stock and ready to ship to all you good little hams each December. On the right is Bob's elf in charge of getting those toys on their way—although perhaps not by sleigh (unless you hook up some flying reindeer to the front of a UPS truck)—Sales Manager Howard Califf, KE6PWH. They're behind the counter at HRO's store in Sunnyvale, California, where all sorts of ham radio goodies are on display.

If you're still in the market for a ham radio holiday gift, check out this issue's ads for HRO and all the other fine dealers who advertise in *CQ*, find what you want, then "just happen" to leave the magazine open to the appropriate page in an inconspicuous location … such as the kitchen table.

Happy holidays from all of us at *CQ*, and may the new year bring us all peace, prosperity, good health, and happiness. *(Cover photo by Larry Mulvehill, WB2ZPI)*

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- "Still Chasing the Invisible Wave," by RV3IZ
- "My Father, Ham Radio and Me," by K2MMT
- "A Visit to Quartzfest," by WB6NOA
- Results, 2004 CQ World-Wide WPX SSB Contest

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FNB-58Li Li-ION pack 7.2v 1300mAh $39.95

For Yaesu-Vertex FT-60R, VX-110, 150, 210; VXA-120 etc
FNB-V57x Ni-MH pack 7.2v 1800mAh $39.95

For Vertex Standard VX-2R : (Lithium ION – NEW !)
FNB-82Li Li-ION pack 3.7v 1050mAh $29.95

For YAESU - Vertex FT-817 (Backpacker Radio) :
FNB-72xh N-iMH pack 9.6v 2300mAh $49.95

For YAESU FT-50/R/D / 40R / 10R / VXA-100 etc: (w/ clip)
FNB-41xh 5W Ni-MH pk 9.6v 1100mAh $45.95

For YAESU FT-11R / 41R / 51R : (Factory Brand Packs !)
FNB-38 5W Ni-Cd pack 9.6v 600mAh $29.95
FNB-31 Ni-Cd pack 4.8v 600mAh $19.95

For YAESU FT-530 / 416 / 415 / 816 / 76 / 26 etc :
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For ICOM IC-Z1A, T22A, T42A, W31A, W32A, T7A :
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For ICOM IC-02AT etc & Radio Shack HTX-202 / 404 :
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BP-202h pack (HTX-202) 7.2v 1400mAh $29.95
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For KENWOOD TH-235A etc. (Hard-to-find !) :
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For ALINCO DJ-195,HP,R / 196 / 446 / 493 / 496 / 596 etc :
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For ALINCO DJ-G5TD,TH,TY / 190T,TD,TH / 191T,TD,TH:
EBP-36h 5w Ni-MH pk. 9.6v 1200mAh $44.95

For ALINCO DJ-580 / 580T / 582 / 180 / 280T / 480 etc :
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